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ABSTRACT

Personnel in the rehabilitation field have come to recognize the possibilities and implications of computers as assistive technology for disabled persons. This manual provides information on how to adapt the Unicorn Board, Touch Talker/Light Talker overlays, the Adaptive Firmware Card setup disk, and Trace-Transparent Access Module (T-TAM) to assist individual clients. The information is organized in 4 parts: Part 1: "Introduction"; Part 2: "The Adaptive Firmware Card"; Part 3: "Trace Transparent Access Module" (T-TAM); and Part 4: "Setups and Overlays for Creativity Programs." Three appendices provide supplementary information: Other Adaptive Interfaces, Troubleshooting Operational Difficulties, and Equipment Configuration Diagrams. (MM)

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ACCESS TO THE ARTS through ASSISTIVE TECHNOLOGY

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Charles Frame

Published by Young Artist Workshops, St. Norbert College

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ACCESS TO THE ARTS
through
ASSISTIVE TECHNOLOGY

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INTRODUCTION

THE ACCESS TO THE ARTS THROUGH ASSISTIVE TECHNOLOGY RESEARCH PROJECT AND THE YOUNG ARTISTS WORKSHOPS AT ST. NORBERT COLLEGE

The Young Artists Workshops Program (YAW) is many things: (a) an interdisciplinary arts program, (b) a research and demonstration site, and (c) a teacher training program. Perhaps most inportantly, it is aProgram that provides young people with disabilities an exciting and frequently first in-depth encounter with the visual and performing arts. We believe every child, regardless of the disability, can enjoy some aspects of the arts if suitable adaptations are made to increase access to the various art forms.

Founded in 1985, it is in its seventh year of providing a three-week full-time program for visual and performing arts experiences for disabled youth in Northeastern Wisconsin. Program participants range in age from 3-22 and most disabling conditions encountered in the schools are represented.

The Program combines our disabled, but most capable, young artists with a dedicated staff of over 60 professionals representing many areas of expertise. Visual artists, musicians, dancers, photographers, and actors, combine their talents with arts educators, therapists, and special education staff that are drawn to the Program from several states (and even other countries, such as England and Germany) to participate in this unique encounter with the arts.

In addition to providing a summer arts experience, the YAW provides a program of year-round teacher training and retraining to help arts educators increase their abilities to work with disabled young people that are mainstreamed or integrated into the regular classroom.

YAW is also a research and dissemination site that has been supported by major grants from the National Endowment for the Arts--Polaroid, Kodak, and IBM--to develop techniques for increasing accessibility to the arts. Its activities include: developing materials for teacher training, consulting with area school districts and agencies, publishing resource materials, producing video tapes, conducting workshops and institutes, and doing presentations at a variety of professional educational conferences throughout the United States and Canada.

Publications have included photography, visual arts, and music resource guides to help educators identify important resources for improving the instruction of the arts with disabled youth. It has also developed instructional television teacher resource materials that have been professionally produced and are being distributed nationally and internationally. These have included Access to Photography for the Physically Challenged (video and book), Visual Arts and the Physically Challenged Person (video and guide), and a new video, *IF YOU CAN MOVE YOUR HEAD, YOU CAN MOVE YOUR WORLD: NEW APPLICATIONS FOR ASSISTIVE TECHNOLOGY*. Materials are distributed internationally by the Agency for Instructional Technology (AIT), and Video Education Australasia (VEA).

Project staff have served as consultants for area school districts and the Wisconsin Department of Public Instruction in development of curriculum resource materials for arts and the exceptional education needs (EEN) student. Support from the Wisconsin Association for Physical Education, Health, Recreation and Dance, the Wisconsin Arts Board, Wisconsin Heart Association, and United Way, have underwritten several experimental programs bringing together the talents of physical therapists, movement therapists, adaptive physical education specialists, and dancers to develop creative movement activities for young people who are physically challenged.

The child with limited physical coordination can operate 35 mm, instant print cameras, and video camcorders to record, interpret, or share images with an audience with which communication was previously impossible. Collaborative research projects in media arts have been supported since 1987 by Kodak and Polaroid, and in 1990 by Photographic Education Group (PEG) in England.

The summer Young Artist Workshops Program has become a practicum for continued education and teacher training in Adaptive Education and the Arts, a new teacher certification option. The Program also conducts an annual series of workshops for area educators in cooperation with area school districts, Cooperative Education Service Agencies of the Wisconsin Department of Public Instruction, and area human service agencies. A new program entering its third year conducts pre-service and in-service training for special education instructional aides in cooperation with area school districts.

Our young artists become both our students and our teachers as we develop our skills and assist other teachers to better meet the needs of our most gifted and most capable, although disabled, young artists. Since 1985, over 600 young artists who happen to be disabled have participated in summer YAW programs. Over a thousand teachers have also participated in workshops, conferences, seminars, and institutes that have been part of the YAW outreach.

The most ambitious and innovative project in its seven years of existence has been a major on-going research effort supported by the National Endowment for the Arts, IBM, the Prentke-Romich Company, Don Johnston Developmental Equipment Company, North Shore Computing, Connecting Point Computer Center, area education agencies, the Wisconsin Department of Public Instruction and the St. Norbert College community. The Access to the Arts Through Assistive Technology project develops means for the non-vocal, physically challenged, or multi-handicapped individual to gain access to the visual arts, music, and creative writing through computer communication systems with off-the-shelf software and standard computer equipment. The non-vocal child without using his hands can still compose music, perform, or sing electronically. The physically challenged child without the strength to lift an arm or control to use a finger can look at or talk to the computer screen and produce computer art or do creative writing. Field testing of keyboard overlays, setups, and varied interface devices has been conducted in the Green Bay Area Public Schools, in the summer YAW programs, and at a local Cerebral Palsy Center. Intensive instruction took place with physically challenged students and persons with communication disorders during the 1990-91 summer YAW. The project culminated in a package of overlays, interface device setups, and an instruction manual that is being disseminated nationally to help provide access to the arts through assistive technology. A companion professionally-produced video tape mentioned earlier, *IF YOU CAN MOVE YOUR HEAD, YOU CAN MOVE YOUR WORLD: NEW APPLICATIONS FOR ASSISTIVE TECHNOLOGY*, is also available through the YAW.

We are grateful to the many supporters of our project, the dedicated professional staff, the parents who generously shared their children with us, the St. Norbert College community, and particularly to Chuck Frame, an Assistive Technology Specialist in the Green Bay Area Schools, whose imagination, ingenuity, and dedication helped make this Assistive Technology project a reality.

Charles R. Peterson
Professor of Art and Education
Director of YAW
St. Norbert College
July, 1991

The Access to theArts through Assistive Technology Project is supported by a Grant from the National Endowment for the Arts.

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PART I: INTRODUCTION

With the development of the personal computer in the late 1970's, many personnel in the rehabilitation fields became excited at the possibilities and implications for handicapped persons. With special keyguards and other keyboard adaptations, some handicapped persons could do word processing, spreadsheets, and databases on the computer. The development of the Adaptive Firmware Card and the Unicorn Expanded Keyboard opened up computer access to even more persons with handicaps. Although pointing devices such as the mouse appeared in 1982 on some IBM computers, they worked with little software. Practically all programs were text-based and required only alphanumeric input to operate.

The graphical user interface which made extensive use of the mouse did not catch on until the Macintosh was released in January 1984. However, most handicapped users, it seemed, used Apple II's and it was rare to see a mouse on an Apple II. Then, in September of 1986, the Apple IIGS was released and the mouse was standard equipment. Apple IIGS specific software began to imitate the Macintosh graphical user interface, and that demanded use of the mouse. Paint/draw and music composition software, as well as games, began to appear in droves--all based around use of the mouse. The graphical user interface migrated to the IBM and, with the appearance of Windows 3.0 in the summer of 1990, became the new IBM standard. Because the mouse is notoriously difficult for a handicapped person to manipulate, it seemed that the gap that the computer was closing between handicapped and able-bodied persons was beginning to widen again.

A Seattle-based company called Adaptive Peripherals, the creator of the original Adaptive Firmware Card, rose to the challenge and came up with a new AFC for the Apple IIGS that featured, among other things, mouse emulation capabilities. With the appearance of the Trace-Transparent Access Module (T-TAM) in the fall of 1990, it was possible for users of dedicated communication aids, such as the TouchTalker and LightTalker, to interface to the Macintosh, Apple IIGS and IBM with full mouse emulation. And with the Trace Access Utility, a software-only T-TAM emulator disguised as a Windows 3.0 desk accessary, it became possible to directly connect a TouchTalker/LightTalker to an IBM's Com1 serial port to drive Windows 3.0 programs. At the same time, a new device called the Ke:nx gave the Macintosh the same adaptive functionality that the AFC gave the Apple IIGS. The work that remained was for professionals who work with handicapped persons to start using these tools to program adaptive mouse-emulation interfaces to open up access to a whole host of mouse-driven creativity programs.

It was experimental work in this area in the Green Bay, Wisconsin Public Schools and later in the Young Artist Workshop at St. Norbert College that resulted in the Assistive Technology and the Arts project. The package of Unicorn Board and TouchTalker/LightTalker overlays, Adaptive Firmware Card setup disk, T-TAM code, and this manual are a product of that project.

It is our pleasure to be able to share this work with you. In this manual you will find information on how to adapt these setups and overlays for your individual clients.

Since many of you have experience using the Adaptive Firmware Card and Unicorn Board, it is expected that you will want to "jump in" and get started right away! You may turn directly to section IV-A. for information on how to get your favorite program up and running. TouchTalker/LightTalker users can turn to section IV-B for information on how to program your devices to perform mouse emulation through the Adaptive Firmware Card and T-TAM. For the rest, you may find that browsing through the manual and reading those parts of interest to you will help you get the most out of the package. In the Appendix, you will find a section on other direct-input alternative input devices which may give persons with handicaps access to creativity software on the computer, as well as a section on troubleshooting operational difficulties when using the setups in this package.

We would appreciate hearing your comments and criticisms of this package, along with any suggestions for improvement.

What Is In This Package?

Three different "Key to the Arts" are available. If you purchased "Key to the Arts: Unicorn Expanded Keyboard Version" then you received a set of twelve Adaptive Firmware Card setups on one 3.5" disk, and twelve corresponding Unicorn Board overlays. If you purchased the "Key to the Arts: TouchTalker/LightTalker" version, then you received three AFC-ASCII setups on a 3.5" disk, six corresponding AFC overlays (three each for Touch Talker and LightTalker), and instructions for programming AFC code into your device. You also received four overlays (two each for the TouchTalker and LightTalker) for programs that operate with Trace-Transparent Access Module, and corresponding T-TAM code to program into your device.

If you purchased "Key to the Arts: Complete Package" then you received all of the above.

The AFC setups for the Unicorn Board interpret keypresses from the Unicorn board that have been predefined as either alphanumeric input, control characters. or mouse macros. The overlays, which are designed to fit under

the plastic cover of the Unicorn Board, correspond to twelve popular creativity software packages. These programs are the following: The Electric Crayon, Dazzle Draw, FaceMaker Gold, Children's Writing and Publishing Center, Once Upon a Time,Paintworks Plus, KidWriter Gold, Cartooners, Music Studio, HyperStudio, HyperKeys, and PrintShop GS. The first four programs will work on the Apple IIGS with either the AFC G32 or AFC G32e. Detailed information on creating "mouse tabs" and "mouse macros" and modifying the above setups may be found in the section "Introduction to AFC Mouse Macro Programming."

The three AFC TouchTalker/LightTalker setups and overlays are for the Electric Crayon, KidWriter Gold, and Music Studio's "Paint Box" (Apple IIGS only). The setups are found on your AFC Menu and Construction Disk and have the letters "ASCII" after them. For information on how to configure your TouchTalker/LightTalker to "communicate" with the AFC, see the section on "AFC/TouchTalker-LightTalker."

The overlay for MyPaint is for use with the Trace-Transparent Access Module on the Apple IIGS. In addition, there are two Electric Crayon overlays for the TouchTalker/LightTalker specifically for use with the Electric Crayon on the IBM using the T-TAM.

For further information on using these, see section IV-C "T-TAM/TouchTalker-LightTalker.

The "Key to the Arts" package does not include any of the application software itself. But it does provide adaptive access to fourteen popular creativity software packages.

What is Mouse Emulation?

Most paint/draw, music composition programs, and games make heavy use of the mouse for input. These programs may or may not employ the standard graphical user interface with a menu bar at the top of the screen and pull-down menus. Some programs have keyboard equivalents for operations that are normally performed by the mouse. These shortcuts usually start with "open-apple" followed by a letter.

Since a handicapped person normally does not have the fine motor control to manually manipulate a mouse, some other means of controlling the actions of the mouse must be employed. If one could somehow send commands to the computer from an expanded keyboard, for example, that would navigate the cursor around on the screen, jump it to predetermined locations, and send mouse-button states by simply activating one square, then the problem would be solved.

The Adaptive Firmware Card, Model G32 for the Apple IIGS was the first interface device to appear with mouse emulation capabilities. With it one can program simple, or quite long and complex, mouse "macros." Mouse macros can automate the process of selecting tools or colors in a paint program, or automatically selecting functions from the menu bar with just one key activation. The AFC functions in one of two modes, whether you are using a Unicorn Expanded Keyboard, or a TouchTalker/LightTalker as your input device. It is either in mouse emulation mode, or text mode. For the most part, the setups in this package allow the user to move "transparently" between text-entry mode and mouse-emulation mode without being aware that it is happening. We have programmed the interfaces to "insulate" the user from the mechanics of mode-switching so that they can concentrate their efforts on the creative process rather than on thinking about how to use the interface.

Design Philosophy for Overlays

An "overlay" can be defined as being comprised of the characters you see and hear when you use your input method, and the characters the AFC sends to the computer when you make a selection with your input device. We could further extend the definition of "overlay" to include a paper grid which covers the keys of an expanded keyboard or dedicated communication device, and which graphically indicates what action will be performed when a key is activated. The latter meaning is what is commonly meant in this manual when referring to an "overlay."

We have designed each overlay so that it matches as closely as possible what the user sees on the screen while an application program is running. Therefore, touching a particular area on the overlay is like actually touching that area on the screen. In a paint program, for example, simply touching a color in the color palette on the Unicorn Board, or communication device, activates a mouse macro that selects that color on the screen.

In order to navigate around the screen and place the cursor in a particular location, four large up, down, left and right arrow keys, as well as arrows for diagonal movement, are provided on the overlay. For the Unicorn Board, simply touching and holding down an arrow key will cause the cursor to start moving in that direction. Releasing the arrow key will cause it to stop. Precise control can be obtained by "tapping" the arrow key, thereby nudging the cursor along in very small increments.

Mouse button states are also represented by keys on the overlays. See Figure 1. The three most common button states are: mouse-down, mouse-up, and click.

The mouse-down button state (see Figure 1a.) is commonly used for "click-and-drag" operations, for example, when drawing lines or shapes in a paint/draw program, or moving parts of graphics that have been selected with the "selection rectangle." It can also be used to pull down and hold down a menu while looking at the choices.

The mouse-up button state (see Figure 1b.) normally terminates a mouse-down operation. In AFC mouse emulation, a mouse-up is sometimes needed to complete the action of a mouse macro.

A click (see Figure 1c.) is normally used to select a choice on the screen, or in scroll boxes and in dialog boxes.

Another button state is the "double-click." It normally is not used in mouse emulation because its main function is "launching" programs from the Apple IIGS or Macintosh "Finder," or from MS-Windows "Program Manager."

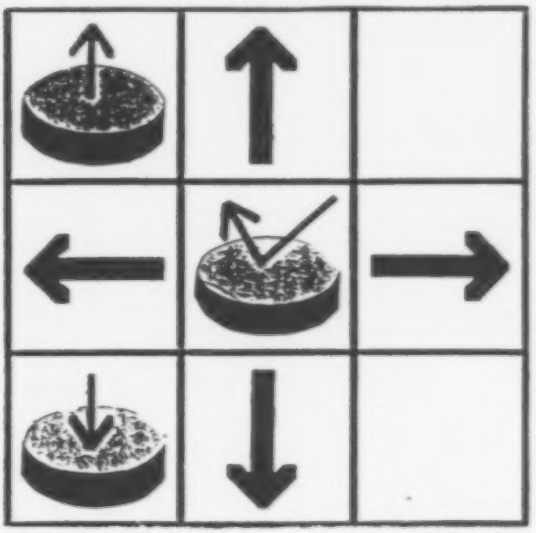
Where programs use a conventional menu bar, simply touching a menu bar selection on the alternate keyboard causes that menu to be pulled down on the screen and latched so that all the options are showing. Selections from the pulled-down menu can be highlighted by scrolling through them with the up and down arrow keys on the alternative keyboard. Pushing the "click" button then actually activates that selection.

Figure #1

Figure 1b

Figure 1c

Figure 1a



In some application programs, many of the functions in the pull-down menus need to be immediately available with only one key activation in order to make the program more "ergonomically" efficient for the user. A good example of this can be seen by examining the Music Studio overlay. This overlay was initially programmed so that the user had to pull-down the "Notes" menus with one key activation, then scroll down to the desired note with the up/down arrows, select with a click, and then use the up/down--left/right arrows to place the note on the staff. It was quickly found that composing even a short, simple song required a huge number of activations. By giving each note its own key on the overlay, and programming a macro to take care of the business of selecting it and placing it on the staff, the amount of "work" required of the user was reduced by 80%! Further re-programming was done so that any of 15 musical instruments could be selected with one keystroke. Allowing easy selection of an instrument prior to selection of a note freed the user to utilize more variety in his/her composition. To the extent that the amount of effort required to compose a song was reduced, the user's compositions could become longer, more complex, and more creative.

Overlay design philosophy, therefore, needs to take into account the amount of effort required of the user. Generally speaking, if the effort required is too high, we can expect the product to lack spontaneity and creativity. Therefore, the goal in programming an adaptive mouse emulation interface is not just "access." The goal ideally should be to make the program just as easy to use for the handicapped user as it is for the able-bodied user. In practice this is not often possible, but by extensively employing complex mouse macros, we can go a long way toward "closing the gap" between handicapped and able-bodied users.

PART II: THE ADAPTIVE FIRMWARE CARD

AFC Input Methods

The Adaptive Firmware Card allows you to use one or more switches, an expanded or miniature keyboard, or specific other input devices to run software which is usually operated through the standard Apple keyboard and/or mouse. The AFC input methods fall into seven broad categories:

1. The assisted keyboard method provides assistance to one-finger or headwand/mouthstick typists, who use the

standard Apple keyboard but have difficulty with the Automatic Repeat and with holding down two or more keys at the same time.

2. The expanded keyboard method allows you to operate the Apple from an expanded or miniature keyboard.
3. The Morse code methods enable you to run the computer by sending Morse code via one or two switches.
4. The scanning methods allow you to press a single switch to bring up a line of characters on the second-to-bottom line of the computer screen. You run the computer by using your switch to select items from this line of characters.
5. The multiple switch box method allows keyboard-like operation from 1-2 switches connected to the I/O box or from 1 to 8 switches connected to a multiple switch box.
6. The normal-input method allows switches to work in parallel or in place of game buttons. This is useful when the program you are running was written for switch input.
7. The ASCII-input methods allow you to run the computer by means of certain portable communication devices. A special cable is needed from the device to the Adaptive Firmware Card I/O box. (AFC Operator's Manual and Application Guide, 1988).

Programs which use the mouse can be operated only through the expanded keyboard, Morse code, scanning, multiple switch box, and the ASCII-input methods. Only the expanded keyboard, scanning, and ASCII-input methods work well enough to be practical.

This package includes only setups and overlays for the expanded keyboard and ASCII-input method. The Unicorn Board and TouchTalker setups and overlays may be used by those with manual pointing skills, and by headstick/mouthstick users. The LightTalker setups and overlays accomodate those who cannot physically point but who have enough head/neck control to operate an optical light pointer.

For those users who can only use single switches with scanning, several such setups may be found on the AFC Menu and Construction Disk which comes with the Adaptive Firmware Card.

Parts of a Setup

A setup is a set of instructions that tells the Adaptive Firmware Card how you want to use the AFC with a particular application program. It provides a way of defining each key on an expanded keyboard, or a dedicated communication device, to perform a particular action or function. Normally, a setup is loaded from the AFC Menu and Construction Disk prior to running an application program. It is possible to store a setup on the AFC's battery-backed up memory and select it from the AFC's "quick-start" menu upon start-up of your computer.

Every setup can have the following parts: Title, Description, Method, Rate, Overlay, Special Options, and Macros. The **Title** is the name of the setup, as shown on the Extended Menu. The **Description** is what you see when you press RETURN to zoom in on the setup. **Method** is the AFC input method you will be using to run the computer, such as scanning, Morse code, expanded keyboard, etc. **Rate** determines how quickly you can manage your input method. The **Overlay** is comprised of the characters you see and hear when you use your input method, and the characters the AFC sends to the computer when you make a selection with your input device. **Special Options** are optional fine-tuning features which you may want to activate in particular setups, such as slowing down the application program or activating speech feedback in the AFC overlay. Finally, **Macros** are optional strings of characters or functions which can help speed up the process of using your application, including sending text or executing mouse commands (AFC Operator's Manual and Application Guide, 1988).

Introduction to AFC Mouse Macro Programming

To program a setup that employs mouse macros, you use the AFC Setup disk and create a new setup, the same as if you were creating a talking word board. You may need to go into the Special Options menu and turn on the options "AFC Macros" and "AFC Mouse." In order to allow you to use mouse emulation from the Unicorn Board, you need to program one square that will let you enter Mouse mode. Select a square that you wish to use for this purpose. The square in the upper right hand corner works well for this purpose. Push this square. When you see "AFC receives", hit escape. From the menu of control characters, select "AFC.Mouse. Hit return. Hit return again to save your command.

Now, select a location that you wish to use to control the mouse. Instead of typing in text, hit "escape" and you will again be presented with a menu of control characters. Scroll down through these until you see the option "AFC.Macro." Hit return and "AFC.Macro" will appear on the message line. Now type in a code for the macro you a programming, such as AA. Your message line will now look like: "AFC.Macro.AA". Hit "enter" to keep this message and go on to program your next square. When you are finished programming, save your setup and return to the "Menu and Construction Disk Setup Menu."

It is now time to program in "mouse tabs," which are screen x-y coordinates for plotting the action and location of the cursor. Since the Apple IIGS screen is 320 pixels horizontally, and 200 pixels vertically (when in normal Super HiRes mode), any coordinate will be expressed as the intersection of a vertical column and horizontal line. Load the setup you just created, then load your application program. Enter mouse emulation mode by pressing the square that you programmed, "AFC.Mouse."

You will see a message on the screen, "Entering Mouse Emulation Mode." Hit return at this time. You are now ready to program your first mouse macro. Using the mouse, move the cursor to the point on the screen that you wish your cursor to jump to. Hit the "Tab" key two times. You will hear a "blip" and then see a message that says, "Enter Tab Name." Type "AA" and then hit return. You have just set a mouse tab. You can verify this by hitting "Tab" one time, then typing in "AA". You will see the cursor jump to the exact spot on the screen where you had placed it to set the tab.

With the mouse tab set, you can now program your mouse macro. Hit the "/" key (just to the right of the spacebar) and then hit "." You will see the message "Enter Name for AFC.Macro." Type "AA". Then it will say, "Enter message." At this point you have to instruct the cursor to move to the tab you just set. So hit the tab key. You will see the @ symbol appear. This is the AFC code for "Tab." Now type in AA. Your macro now knows to jump to the screen coordinates for the tab that you named AA. Now you need to specify a mouse button action. The AFC codes are "B" for "button down", "C" for "click"; and "X" for "button up." For this exercise, select "C". The message should now read, "@AAC". Hit return to keep this macro.

The macro is now fully functional and you can test it immediately by touching the key on the Unicorn Board that you selected for this macro. The cursor should jump to the Tab AA screen location, followed by a "click." Congratulations!! You have just programmed your first mouse macro!

To extend the macro to make it even more functional, there are two further AFC macro commands that can be added to the previous macro. They are the Fix and Go commands. For instance, if you wanted the macro to start from the current cursor location, wherever that might be, you begin the macro command with the letter F. That will Fix the current cursor location and hold it in memory while the macro is executing. By ending the macro command with a G, or Go, the cursor will return to the screen location at which it started. So the command would look like: "F@AACG." Try modifying your macro now to see how this works.

Fix and Go are "ergonomically" helpful in saving the effort of a manual return of the cursor to the work area of the screen. Without it, in a paint program for example, whenever a drawing tool or a color from the paint pallette were selected, the cursor would be left "stranded" off the work area.

You may now save the macro to the AFC Menu and Construction Disk by holding down the Control and A keys simultaneously. Let them both up, and then hit "3." You may then eject your application disk from the drive and insert the AFC Menu and Construction Disk. Hit return; your computer will re-boot, load the AFC disk and automatically save your mouse tabs and macros into the correct setup!

Of course, mouse tabs and mouse button events can be strung together to form very long and complicated macros. One example would be sending the cursor up to the menu bar, sending a "button down" to pull down and latch a menu, moving the cursor down to a selection, sending a mouse click to select it resulting in a dialog box, then sending the cursor to a specific point in a dialog box to await further input from the user.

You will find that very long and complicated mouse macros not only save much work for the handicapped user, but also execute the same commands much faster than an able-bodied person would be able to execute them manually with the mouse! The HyperStudio setup in this package makes extensive use of very complicated mouse macros.

Feel free to examine the code in the Menu and Construction Disk to see how the macros in any of the setups were constructed. For those of you who are more adventurous, make a backup copy of your Menu and Construction Disk; using your backup copy, experiment with modifying some of the setups. You may find it necessary to do this for some of your clients anyway in order to move frequently used commands to an area of the Unicorn Board which is more easily accessed by your client.

A good way to teach yourself AFC mouse macro programming would be to print out hard copies of the overlay, mouse macros, and mouse tabs from within a particular AFC setup; then pencil in the overlay and macro codes onto a blank 128-square grid and re-program the setup yourself. With some practice you will soon feel comfortable programming your own custom mouse emulation setups!

AFC/TouchTalker-LightTalker

To use the TouchTalker/LightTalker as an alternative input device with the Adaptive Firmware Card, three things are needed: a special ASCII setup which is loaded off the Menu and Construction Disk; an interface cable

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with a DB-25 connector on one end and a 36-pin Centronics connector on the other; and a custom overlay.

The ASCII setup receives ASCII code from the TouchTalker/LightTalker. This is represented by the letters A-Z, the numbers 0-9, and various special characters and punctuation symbols. A letter, number, or special character can be programmed into any location on the communication device and defined in the setup as a mouse macro, navigational arrow, or as straight text. The ASCII characters, which can be programmed into a one-or two-symbol theme in the communication overlay, are sent out of Serial Port B on the device. They are transmitted via a special cable to the AFC's junction box.

In order to set up the correct communication protocol, you must first enter the communication aid's 128-location fixed base. Using the fixed overlay as a guide, set the Serial Select (location I-4) to "Serial Port B." Set the Baud Rate (location I-5) to 300. Then select "Serial On" (location J-6). Then go back to custom base by selecting M-7 and M-6.

Load the ASCII setup from the Menu and Construction Disk. Then load the application program. There are three ways to enter mouse-emulation mode. You may select location P-1 which is programmed to turn mouse emulation on. Alternatively, you may turn the LT/TT on, and then off. Turning the device off causes the setup to enter mouse emulation mode. Hit Return on the computer keyboard and then turn the device back on. Or from the keyboard you may type the sequence "/=". You may now use the overlay with your application program.

There are three ASCII setups on your Menu and Construction Disk: one for the Sesame Street Crayon, KidWriter Gold, and Music Studio's "PaintBox". Their corresponding overlays, three for the TouchTalker and three for the LightTalker, need to be exchanged with the custom communication overlay before using.

PART III: TRACE TRANSPARENT ACCESS MODULE (T-TAM)

The Trace Transparent Access Module (T-TAM) is a small box which is connected between the keyboard (and mouse if available) and the computer. The T-TAM allows many individuals to access and use the computer even if they cannot use a standard keyboard and mouse.

T-TAM Input Methods

The T-TAM actually performs several functions to allow both disabled and able-bodied users to access the computer. The T-TAM modifies the behavior of the standard keyboard so that it can be used by people with mild or moderate disabilities. The T-TAM also allows the user to change the function of the shift key and other modifier keys to that rather than having to hold two or more keys down at the same time, the user can type one key and then the next key, etc. This feature enables someone who types with one finger, a mouthstick, or a headstick to type required multiple key combinations. The T-TAM can slow down the response of the keyboard so that inadvertently pressed keys will not be sent to the computer while also allowing the user to adjust or turn off the key repeat rate. The T-TAM will emit tones when the Caps Lock, Num Lock, and Scroll Lock keys are pressed so users who cannot see the lights on the keyboard can tell whether these keys/functions are on or off.

For those individuals who cannot use the mouse, the T-TAM provides a MouseKey feature which enables a user to control the mouse movement and mouse button clicks from the keys on the computer keyboard. For individuals who cannot use the standard keyboard or mouse (even with modifications), the T-TAM has a "General Input Device Emulating Interface" which allows people to use augmentative communication aids or other special aids in place of the computer keyboard and mouse.

Connecting to Macintosh/Apple IIGS/IBM

The T-TAM works with all Apple computers which use the Apple Desktop Bus (ADB) for mouse and keyboard connections. This includes the Apple IIGS and all of the Macintosh computers except the Mac Plus, 512 and 128. It will not work with an Apple IIe unless you have upgraded it to a IIGS. The T-TAM works with all the IBM PS/2 series of computers, including those with MicroChannel. The T-TAM will work with IBM AT computers. However, the AT's do not have a standard mouse or a mouse port and will be unable to emulate the mouse functions of the T-TAM. The T-TAM does not work with the original IBM PC or XT computers. (from draft of T-TAM manual rev. 4.0 of August 1990, Trace Research and Development Center, Madison, Wisconsin)

T-TAM/TouchTalker-LightTalker

The following are details on setting up the TouchTalker/LightTalker to operate with the T-TAM using mouse emulation. A serial communications cable with male DB-25 connector on one end connects into Serial Port B of the TT/LT and the female DB-25 connector on the other end plugs into the T-TAM. From 128-location Fixed Base, set the Serial Select to "Serial Port B," set Baud Rate to "300" and select "Serial On."

There is no setup disk to load as with the Adaptive Firmware Card. All commands are programmed under keys on the TT/LT and are sent out the serial port to the T-TAM which which interprets them to control the keyboard and mouse. By programming a two-symbol theme or level which is used only to control the computer through the T-TAM, you will have instant access to this feature at any time.

T-TAM Mouse Macro Programming

The specifics of programming mouse emulation for controlling paint/draw and music programs are the following. All mouse emulation commands begin with an escape character. On the TT/LT an escape character is programmed by first selecting "CTRL" on the fixed overlay (location I-8), then selecting the left bracket ([) symbol (location D-4). After making these selections, you will see nothing on the LCD readout, but you will notice that the cursor has moved one space to the right.

To begin mouse emulation, it is necessary to enter the **moureset** command, which will cause the mouse to release any locked buttons, move its position to the upper left hand corner of the screen, and reset its internal x-y positon counter to (0,0). Its format is **<esc>, moureset.**

The **moulock** command allows the user to press down and hold a specified mouse button. Its format is **<esc>, moulock.**

The **mourel** command release the specified mouse buttons after they have been locked. Its format is **<esc>, mourel.**

The **click** command will cause the specified button to be locked down and then immediately released. This action is know as a click. Its format is **<esc>, click.**

The **dblclick** command will cause the specified button to be double clicked. That is, the button is locked down and then immediately released, locked down once again, and immediately released. Its format is **<esc>, dblclick.**

The **goto** command will cause the mouse to move to the specified absolute position. The position is specified as x and y coordinates and represent single pixels on the computer screen. Both x and y values are greater than or equal to 0. The origin of the axis is the upper left hand corner of the screen. The x values on the axis increases to the right, and the y value increases as you move down. Its format is **<esc>, goto, +/-x coordinate, +/-y coordinate.**

The **move** command will cause the mouse to move the specified number of units in the x and y directions. Positive values will move the mouse to the right or down, negative values to the left or up. Its format is **<esc>, move, units in x direction, units in y directions.**

Examples of all these commands are found in the T-TAM code for the Electric Crayon setup for the IBM (see part IV-C) You can get a feel for how mouse emulation works on the T-TAM by programming each of the commands listed into the specified locations in a two-symbol theme of your TT/LT and trying it out. Please note that this setup was created for the Electric Crayon running on an IBM with VGA graphics. It may not work correctly on an IBM or compatible using EGA or CGA graphics. It definitely will not work on an Apple IIGS as is because the IIGS's screen coordinates are entirely different from the IBM. However, it could be easily modified to work on the Apple IIGS by simply defining the screen coordinates for the menu bar functions and the paint palettes and substituting them for the IBM screen coordinates.

T-TAM, or Adaptive Firmware Card?

Advantages of the T-TAM over the Adaptive Firmware Card are that you never have to load a setup from a disk. Setups are located in two-symbol themes "tucked away" in your TT/LT and can be accessed at any time. The T-TAM mouse emulation commands are simple to learn and use.

Disadvantages are the following. It is extremely difficult to plot screen x-y coordinates while programming the T-TAM. It is at best a trial-and-error process. With the Adaptive Firmware Card on the other hand, setting a mouse tab is as simple as moving the cursor to the desired location on the screen, hitting the Tab key twice, and giving the mouse tab a letter name. The screen coordinates are entered into the mouse tab command automatically. The mouse tab can then be incorporated into a mouse macro. Also the Adaptive Firmware Card mouse macro programming language has Fix and Go commands that can be entered into a mouse macro. Fix "remembers" the screen coordinates at which the mouse macro started executing and Go returns the cursor to that location when the

macro is finished. There are many occasions when this feature can save a great deal of effort for the handicapped user. This feature is not possible to implement on the T-TAM.

Probably of most importance to TouchTalker/LightTalker users who have little free memory in their systems is the compactness of a setup's code. An AFC overlay requires just single characters which get sent to the AFC where they are interpreted by the setup as mouse macros, navigational commands, or text.

By contrast, the T-TAM requires you to program rather long sequences of code into your device to execute the same commands. One could conceivably program in a dozen AFC overlays in less memory space than one T-TAM overlay would require.

What the T-TAM delivers that the AFC does not is the ability to use communication aid systems to do keyboard entry and mouse emulation on both the Macintosh and IBM's and compatibles. Since the Ke:nx adaptive input system for the Macintosh does not support ASCII input from communication aids, the T-TAM is at present the only device available for TouchTalker/LightTalker to Macintosh connectivity. The T-TAM is also the only device capable of allowing the TouchTalker/LightTalker to perform mouse emulation on the IBM family of computers.

TouchTalker/LightTalker overlays for the T-TAM are also less confusing to use than AFC setups because they do not require a clumsy toggling back and forth between mouse emulation and text modes. Nor do you "run out" of ASCII characters (letters, numbers, and special characters) to define as macros when programming particularly complex overlays.

The AFC and T-TAM each have their own particular strengths and weaknesses which should be taken into account when planning access to a creativity software package. Unless memory in your TT/LT is the deciding factor, in general the AFC is more flexible for paint/draw programs because of ease of setting mouse tabs, and the Fix and Go commands. The T-TAM is easier to use with creative writing packages that mix text and manipulation of canned graphics (such as KidWriter Gold; Children's Writing and Publishing Center, Once Upon a Time) because of the seamless way it handles mouse emulation and text input.

PART IV: SETUPS AND OVERLAYS FOR CREATIVITY PROGRAMS

A) Adaptive Firmware Card/Unicorn Board

The Electric Crayon

The Electric Crayon AFC setup and overlay is the most versatile of any in this package. It will work with seven children's coloring programs, all published by PolarWare, Inc. The seven programs are the following: *Letters for You, Opposites Attract, Number Count, At the Zoo, Dinosaurs are Forever, All Dogs Go to Heaven, and Holidays and Seasons.* These programs all come with "canned" pictures representing the different themes. The objects and backgrounds in the pictures may be colored in with any of 16 different colors on the color palette. In addition, each color may be "mixed," resulting in 16 variations of that one color. A total of 256 different colors--16 true colors and 240 dithered colors, are possible.

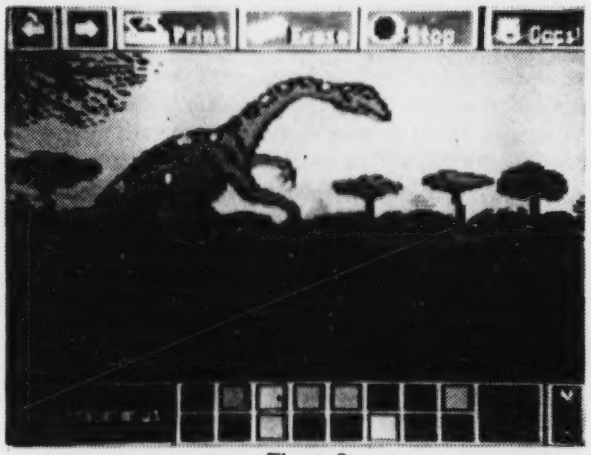

Figure 2

To use the Electric Crayon setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "SS.CRAYON" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk and insert the coloring program of your choice and hit "Return." The program will load automatically.
4. Place the Electric Crayon overlay under the plastic cover of the Unicorn Expanded Keyboard.
5. To enter Mouse Emulation, touch the icon of the mouse in the upper right corner of the overlay, then respond to the screen message "Entering Mouse Emulation" by hitting Return.

You are now ready to use the setup and overlay. You will notice that the mouse continues to function, while you

can use the Unicorn Board to emulate all functions of the mouse. *This is helpful if an able-bodied and a disabled* user are using the program in collaboration.

In Figure 2. you will see a view of the actual screen, and in Figure 3. the overlay. You may choose new pictures by touching the Left-Right arrows in the upper left corner of the overlay. Continuing along the menu bar, you will notice Print-Erase-Stop. Touching any one of these choices results in a "pop-up" dialog box; you can answer its queries by touching the happy face for "yes" or the sad face for "no." "Oops" is an undo function, and will reverse the last action that you performed.

On the overlay, you will notice a set of navigational arrows. By touching an arrow and holding it down, the cursor, or "crayon," will move in that direction. Releasing the arrow causes the cursor to stop. Very precise control can be obtained by tapping the arrow several times, moving it in very small increments. In the middle of the arrows is the "click" button. This simulates clicking the mouse button.

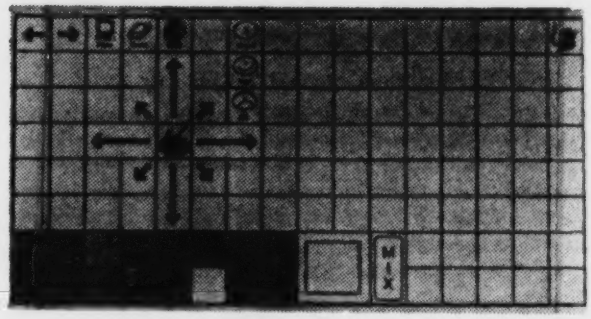

Figure 3

You will notice that the "Fix" and "Go" commands are built into the color selection and "Mix" commands. This allows for much easier experimentation and enhances creativity. For example, if the user wishes to try several different colors on a particular part of the picture, he can choose a color and click. The cursor moves to the color palette and selects that color, then dutifully returns to the exact spot where it started and awaits a click. The user can try several different colors in rapid succession without having to constantly retrieve the cursor from the color palette. One can also choose "Mix" to get 16 variations of a single color. When choosing a mixed color, it is necessary to choose the position in the color palette on the overlay that corresponds to the desired color's position in the palette on the screen.

The Electric Crayon series is a wonderful introduction to color selection and "coloring" for the young handicapped child who has never had experience with conventional pictures and crayons. It is also a good first program on which to learn the principles of mouse emulation using the AFC and Unicorn Board for both young and "not-so-young" users!

Dazzle Draw

Dazzle Draw, from Broderbund Software, is a full-featured free-form draw/paint program that will run on both the Apple IIe and IIGS. It uses a custom graphical user interface with familiar menu bar functions. Dazzle Draw uses a 16-color palette, and is capable of 24 different colored patterns, along with a wide assortment of painting and drawing tools.

A quick look at the normal Dazzle Draw screen (see Figure 4.) does not show many of the functions that are present on the Unicorn Board overlay (see Figure 5.) That is because some tools are only active on the screen when certain functions are selected. The colored patterns, for example, do not show at all until selected, and then the standard color palette disappears. The drawing tools also only appear when drawing functions are selected. Since we need some way of accessing these tools and functions when they do become active, and we are working with a fixed overlay, it is necessary to show all the tools and functions on the overlay, even when some of them are not active. Although this can be a little confusing at first, after the user becomes familiar with all the features of Dazzle Draw, he/she will learn to ignore those tools/functions on the Unicorn Board that are not showing on the screen at the time. In most cases, selecting a tool or function from the

Figure 4

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Unicorn Board that is not showing on the screen will only result in moving the cursor to where that tool or function is normally located and no damage is done.

To use the Dazzle Draw setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "Dazzle.Drw" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk and insert the Dazzle Draw program disk and hit "Return." The program will load automatically.
4. Place the Dazzle Draw overlay under the plastic cover of the Unicorn Expanded Keyboard.
5. To enter Mouse Emulation, touch the icon of the mouse in the upper right corner of the overlay, then respond to the screen message "Entering Mouse Emulation" by hitting Return.

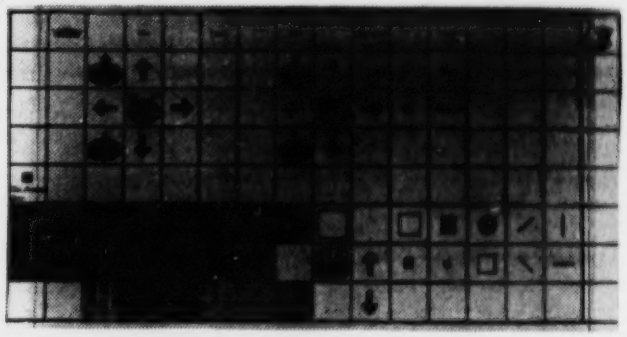

Figure 5

You are now ready to use the setup and overlay. You will notice that the mouse continues to function while you can use the Unicorn Board to emulate all functions of the mouse. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

The menu bar functions, such as the Crown, File, Tools, Edit, Goodies, and Undo may be accessed by touching those squares on the overlay. The corresponding menus will "pull down" and latch, allowing you to scroll down through the choices using the Down arrow. Stop the cursor on your choice and then hit the Click button in the center of the arrow cluster.

Some of the choices under Goodies will result in a dialog box appearing on the screen. You may answer the queries by touching the Yes, No, Okay, or Cancel squares. Along the left side of the navigational arrows, you will notice two buttons, one with an arrow pointing up representing a "mouse button up" state, and one with an arrow pointing down representing a "mouse button down" state. These buttons are used when drawing geometrical shapes and lines, or when selecting and moving a portion of a drawing from one location to the other. They allow one to perform operations analogous to the "click and drag" operation of the mouse.

Every function except font selection and text input is available to the handicapped user in the Dazzle Draw setup and overlay.

FaceMaker Gold

FaceMaker Gold, by Spinnaker Software, is an upgrade to a classic original which may be found in most elementary schools. It is a DOS 3.3 program which runs on an Apple IIe or IIGS and uses keyboard input only. Since this AFC setup and overlay do not require mouse emulation, they are the simplest of the set. An adaptive interface for FaceMaker Gold is included in this package because a Unicorn Board overlay can still make it much easier for physically handicapped persons to use than the standard keyboard.

We have tried to make the overlay as iconic as possible, thereby making the program more accessible to persons with minimal reading skills. See Figure 6. for a screen shot of FaceMaker Gold, and see Figure 7. for the corresponding Unicorn Board overlay.

To use the FaceMaker Gold setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "FaceMaker" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk and insert the FaceMaker Gold program disk and hit "Return." The program will load automatically.

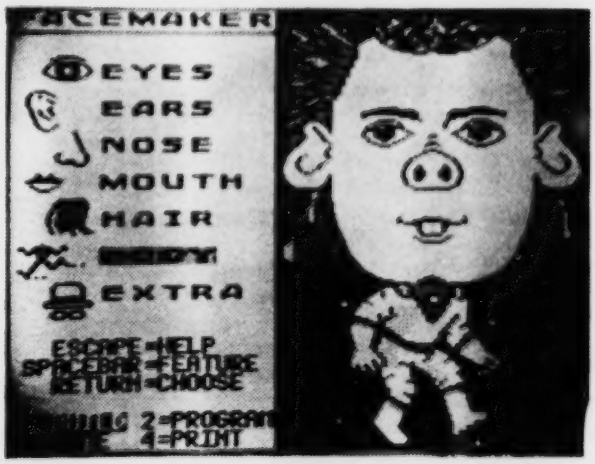

Figure 6

4. Place the FaceMaker Gold overlay under the plastic cover of the Unicorn Expanded Keyboard.

You are now ready to use the setup and overlay. You will notice that while you can use the Unicorn Board to emulate keyboard input, the keyboard itself continues to function. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

On the overlay you will notice four choices-Build, Program, Game, and Print. Build takes you to the Build a face module. The different facial features-Eyes, Ears, Nose, Mouth, Hair-are selected with the Spacebar, and then activated with Return. Then eight different variations of each facial feature appear; these are also selected by scrolling with the Spacebar and activated with Return. The options Clear the Face (C) and Choose a Head (H) can be chosen at any time. They do not show on the screen and so are often not used because one tends to forget that they are available. On the overlay, they are represented by icons, and so tend to be used more.

Figure 7

After the face is built, you can choose to **Program** it, play a **Game**, or **Print** it. Under **Program**, the codes again are represented by icons on the overlay. This makes it possible for a child who does not read to still program the face to perform the eight different actions--Wink, Cry, Cross Eyes, Smile, Frown, Tongue, Ear Wiggle, and Dance.

In the **Game** module, the face performs sequences of the above actions and the object is to remember them and enter their key codes in order. Again, this is not possible for a non-reader using the conventional keyboard, but is easy when using the overlay with the icons.

Finally, **Print** allows the child to get a hard copy of his/her creation.

The FaceMaker Gold AFC setup and overlay not only give access to all the features of the program, but in this case actually make the program more accessible to the non-reader as well as to the physically handicapped user.

Children's Writing and Publishing Center

The *Children's Writing and Publishing Center* from The Learning Company is a popular creative writing tool commonly found in elementary schools. The *CWPC* allows creation of newsletters and stories that mix text and graphics in one environment. It will run on both the Apple IIe and IIGS.

A quick look at the *CWPC* screen (see Figure 8.) and the *CWPC* Unicorn Board overlay (see Figure 9.) will show several significant differences. The overlay does show the menu bar functions--Font, Picture, Next, File, and Print. It does not show the work area, but rather has a keyboard for alphanumeric input, and two sets of navigational arrows. It also has two "Mouse" icons and two "Write Story" squares. In general, this interface is programmed to operate transparently so that the user can move back and forth between mouse emulation mode for handling menu bar functions and manipulating graphics, and text mode for entering written input. However, sometimes it may be necessary to "pull out" of text mode manually in order to enter mouse emulation mode, and vice versa. If things suddenly don't work as expected, hitting the Mouse icon or Write Story square, depending on what you want to do, will straighten things out.

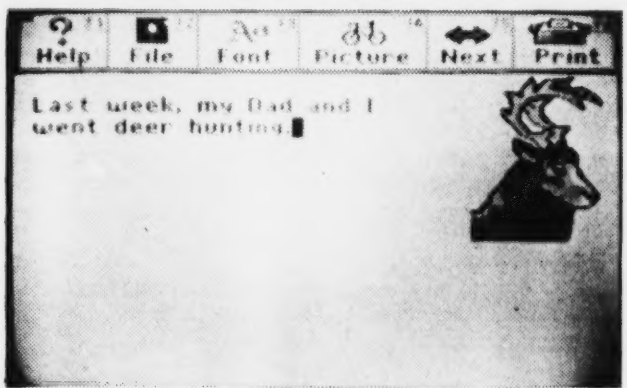

Figure 8

To use the *CWPC* setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "CWPC" from the Extended Menu.

2. Hit Return three times; wait until you see the message that the setup has been loaded.

3. Eject the AFC disk and insert the *CWPC* program disk and hit "Return." The program will load automatically.

4. Place the *CWPC* overlay under the plastic cover of the Unicorn Expanded Keyboard.

This program is set up to enter Mouse Emulation mode automatically when ever you choose a function that is normally accessed by the mouse.

You are now ready to use the setup and overlay. You will notice that while you can use the Unicorn Board to emulate all functions of the mouse, the mouse itself continues to function. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

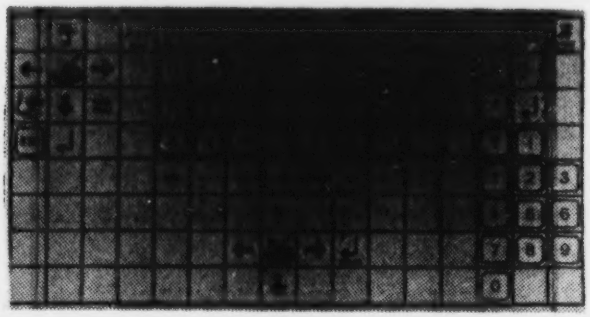

Figure 9

You will notice that *CWPC's* opening screen asks you to make some choices about whether you want to write a newsletter or a story, and whether you want a heading or not. In CWPC selections are sometimes made with left or right arrow keys. To activate a selection, it is necessary to hit the Return key, rather than the Mouse button in the center of the navigational arrows.

On the work screen, you can access the menu bar functions by touching the corresponding square on the overlay. The cursor will pull down the menu and move to the first choice. You can then use the down arrow to scroll through the choices. Hit return when the cursor is on the desired choice. Under the Font menu you can access different type styles and sizes. Under the Picture menu, you can access many graphics under different categories to paste into your layout.

Under the Next, File, and Print menus, you will be presented with choices in a dialogue box. Use the Down arrow to scroll to your choice. You can always back out of a dialogue box by hitting the Escape key.

The Children's Writing and Publishing Center is a wonderful program for enhancing creative written and graphic expression in young children by giving them an easy-to-use, yet powerful, set of creativity tools. This program is now easily accessible to physically handicapped students for use in language therapy or enrichment.

PaintWorks Plus

PaintWorks Plus, by ActiVision, is an Apple IIGS specific paint/draw program that will operate with 512K of memory. A look at the screen shot (see Figure10.) and the overlay (see Figure 11.) will reveal more similarities than differences. All of the drawing tools are represented, although they bend around the top of the overlay. Macros are available to pull down and latch the File, Edit, Goodies, Color, and Font menus. Open and Print under the File menu can be directly invoked with their own macros, as can the Undo function.

You will notice a set of diagonal arrows in addition to the Up, Down, Left, and Right navigational arrows. These were added to facilitate more direct movement to a particular spot on the screen. There are three buttons, one for a Click, one for Button Down, and one for Button Up. Button Down is used to initiate click-and-drag operations normally performed with the mouse, and Button Up terminates such operations.

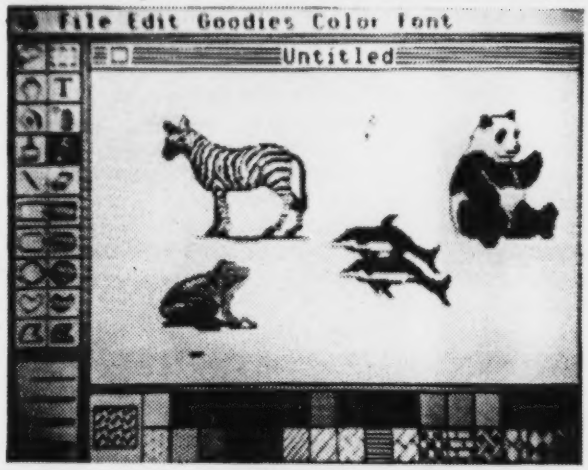

Figure 10

The color palette has 16 standard solid colors. However, other palettes may be chosen, and it is possible to create custom color palettes from a total of 4096 colors! In addition, 16 black and white patterns are available.

The macros that select tools and colors/patterns all start with the Fix command and end with the Go command. This means that the cursor always returns to the exact position on the screen from which it started execution. If not for this technique, the cursor would always be stranded off the canvas whenever a tool or color/pattern was chosen and would have to manually be moved back to the area of the canvas where the user wished to use it. The Fix and Go commands are also included on the overlay so that the user can manually invoke them

when, for example, he wants to move to the opposite side of the screen to perform some operation and then return quickly.

To use the PaintWorks Plus setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "Paint.Plus" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk; insert the PaintWorks Plus program disk and hit "Return." The program will load automatically.
4. Place the PaintWorks Plus overlay under the plastic cover of the Unicorn Expanded Keyboard.
5. To enter Mouse Emulation, touch the icon of the mouse in the upper right corner of the overlay, then respond to the screen message "Entering Mouse Emulation" by hitting Return.

Figure 11

You are now ready to use the setup and overlay. You will notice that the mouse continues to function, while you can use the Unicorn Board to emulate all functions of the mouse. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

The PaintWorks Plus setup and overlay provide access to every function of the program except text entry. The setup enters and remains in mouse emulation mode the entire time you are using it. The navigational tools allow for very precise cursor movement. Accuracy down to the single pixel level can be obtained by "tapping" on the navigational arrows after the cursor has moved close to the desired target area.

Handicapped users will find that free-form drawing and painting is tedious and requires much more effort for a "pay-off" than, for example, the Electric Crayon series or KidWriter Gold. Of course, this is true of able-bodied users as well! It will be interesting to see what kind of creations extremely patient handicapped users will be capable of given complete access to a powerful paint/draw program like PaintWorks Plus.

KidWriter Gold

KidWriter Gold, by Spinnaker Software, is a powerful creative writing tool that mixes stunning computer graphics with text. Although only the Apple IIGS version is supported here, there is also a version for the IBM.

KidWriter Gold allows creation of multiple page stories that can either be self-running on the computer with musical accompaniment, or printed out and bound as a book. (Just a tip--although *KidWriter Gold* itself can only print in black and white, you can get color printouts by optional use of the FingerPrint Gsi card.)

A look at pictures of the screens, (see Figure 12.) and the overlay (sse Figure 13.) reveals significant differences in layout. This is because some options, such as the Picture menus, Color palette, and dialogue boxes only appear after making a choice from the main screen. There is also a keyboard on the overlay for text entry, and two sets of navigational arrows. However, it is necessary to represent all the tools on the fixed overlay so that all these choices can be available to the user.

The opening screen of *Kidwriter Gold* has a "stage" for a background. You will notice menus along the bottom of the screen. They are: Background, Color, Picture, and Tools. Clicking Background brings a new background picture to the screen. There are 16 canned backgrounds to choose from. Although any number of pictures may be laid upon the background, the background itself is not editable.

Clicking on Color will bring up a color palette

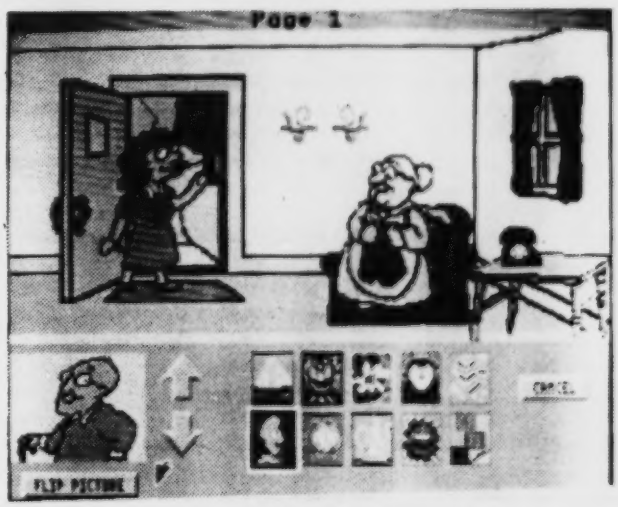

Figure 12

which may be placed at either the bottom or the top of the screen. Colors are selected in mouse emulation by choosing the Black or Pink squares on the overlay and then scanning through them with the Right arrow key. Hit the Click button to select a color. Then move the cursor up to the part of the picture to be modified and Click again. Remember that the background itself cannot be modified; only the pictures which "sit" on top of the background.

Selecting Pictures will bring up a set of 10 iconic menus representing the categories of pictures you may choose from, e.g., Transportation, Monsters, Flowers, Animals, People, etc. You may scroll through all the pictures in a menu by touching the Up/Down arrows to the left of the Picture icons. The pictures will appear in a "window." Picture selection is made by touching the blank picture window on the overlay. The picture then pops up on the canvas and can be maneuvered with the navigational arrows. A Click locks the picture in place. It can be moved elsewhere by clicking on it, making it active, and then repositioning. Be aware that there are also priority levels, i.e., a picture can be brought in front of another by clicking on it, which gives it priority and brings it forward.

Figure 13

The Flip Picture square can change the left/right orientation of the picture. Do this before selecting and placing the picture on the canvas.

Choosing Cancel (to the right of the Picture menus) brings you back to text mode so you can write a paragraph about the scene.

The last item on the menu, Tools, leads to a dialogue box with queries for Quit, Load, and Save.

To use the *KidWriter Gold* setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "KWG" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk; insert the *KidWriter Gold* program disk and hit "Return." The program will load automatically.
4. Place the *KidWriter Gold* overlay under the plastic cover of the Unicorn Expanded Keyboard.

You are now ready to use the setup and overlay. You will notice that the mouse and keyboard continue to function, while you can use the Unicorn Board to emulate all functions of the mouse and keyboard. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

The *KidWriter Gold* AFC setup tightly integrates the mouse emulation and text modes. Each of the mouse macros "falls out" of mouse emulation mode and back into text mode after execution. The user is not aware of all the mode switching going on in the background. Extensive testing has shown this setup to be very stable; however, a Write Story square and Create Picture square are provided on the overlay for manual entry into text or mouse mode respectively in case they are ever needed.

KidWriter Gold has proven to be a favorite of handicapped users. With a minimum of effort, one can create a huge variety of colorful scenes and story plots. It stimulates creative writing in able-bodied and handicapped students alike.

Print Shop

The Print Shop, by Broderbund Software, is probably the most popular program on the Apple II next to *AppleWorks* itself! There are now two versions--the original *Print Shop* for the Apple II and the Apple IIGS version. The Apple IIGS version uses the mouse, and is the version supported in this setup and overlay. We have chosen to support *Print Shop GS* because of its use of color graphics, and because the original *Print Shop* has become dated. A look at Figure 14. will show that the overlay is quite simple and does not look anything like the *Print Shop* screens (see Figure 15.). The reason for this is that *Print Shop GS* has many different screens full of options and it would be impossible to represent them all on one overlay. However, regardless of the screen, the menu choices are always in the same positions and can therefore be easily scanned with Up, Down, Left, and Right arrows. Although menu choice usually appear on the left side of the screen, they sometimes additionally appear on the right. Two sets of navigational arrows are provided on the overlay so that selections on either side of the screen can be easily scanned. Selections are made with the Click buttons.

Every screen has three common elements--the Go Back, Preview, and Go Forward buttons at the bottom. These allow easy navigation between screens.

To use the *Print Shop* setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "Print.Shop" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk; insert the *Print Shop* program disk and hit "Return." The program will load automatically.
4. Place the *Print Shop* overlay under the plastic cover of the Unicorn Expanded Keyboard.
5. To enter Mouse Emulation, touch the icon of the mouse in the upper right corner of the overlay, then respond to the screen message "Entering Mouse Emulation" by hitting Return.

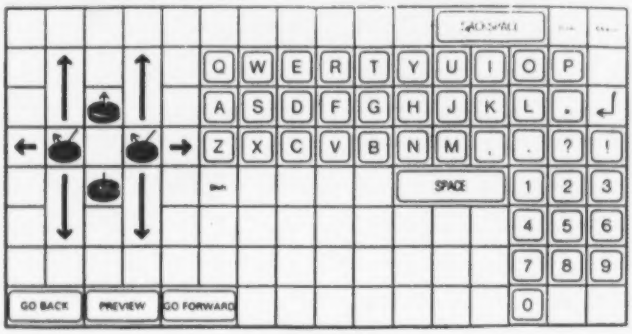

Figure 14

You are now ready to use the setup and overlay. You will notice that the mouse and keyboard continue to function, while you can use the Unicorn Board to emulate all functions of the mouse and keyboard. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

For every *Print Shop* option-Greeting Card, Sign, Banner, etc.-you will want to add a text message. The keyboard on the overlay is provided for that purpose. All the mouse macros are designed to "drop out" into text mode when they finish executing; therefore even though the program itself is shifting back and forth between mouse mode and text mode, this is happening transparently to the user. However, if for some reason the setup should become stuck in either mode, a Mouse icon square and a Ready to Write square are provided that will shift you into mouse mode or text mode respectively.

The Print Shop is a powerful, but easy to use, creativity enhancing program that persons of all ages love to use. This AFC setup and Unicorn Board overlay allow the physically challenged person full access to all features of the *Print Shop*.

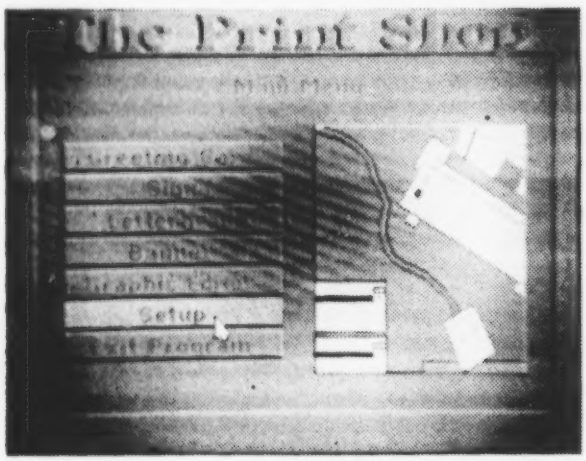

Figure 15

Cartooners

Cartooners, which is published by Electronic Arts, is a captivating animation program which can engross children (and adults!!) for hours on end. Cartooners requires an Apple IIGS with 1 MB of memory. An IBM version is also available; however only the Apple IIGS version is supported at this time.

Cartooners allows one to quickly and easily create an animated cartoon that looks like something you would see on Saturday morning TV! It comes with a dozen canned backgrounds or "scenes" accessed through the Scenes menu on the menu bar (see Figure 16.). You can also create your own backgrounds with a paint program and import them into Cartooners to expand your repertoire. You can access over 50 actors from the Actors menu. Many of the actors have multiple actions, selected from the Act menu. For example, the bunny can walk or hop, the cat can dance and the dog can "moonwalk." Even the "props" can have actions or movements associated with them. Under the Way menu you can specify a direction for the actor to go. From the Music menu, you can select a song or sound effect to accompany the on-screen action. Finally, editable speech balloons give your actors a way to converse with each other.

A look at the Cartooners overlay (see Figure 17.) shows that all of these menus are directly accessible from the Unicorn Board. The File, Edit, Act, and Way menus pull down and latch when selected. You can then scroll down through the choices and click on the target choice.

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Choosing the Actor, Scene, and Music menus results in a mini-finder with scroll bars with many choices available. To facilitate scrolling quickly through a large number of choices, we have included the up and down scroll arrows found under "Way" on the overlay. These macros direct the cursor to the up or down scroll bars and send eight mouse clicks, which cause eight items to scroll by at a time. This makes it very easy to scroll through a large number of choices with just a few activations. When the desired choice appears in the mini-finder, use the up or down navigational arrows to select and then click on it.

Figure 16

When using Cartooners, one is usually in mouse emulation mode, chosen by selecting Create Cartoon. When entering text for a speech balloon, it is necessary to select Enter Text when the speech balloon's text window appears. Type in the desired text, then choose Create Cartoon. Remember that if you wish to use any of the Font, Size, Style, or Layout options in the speech balloon text window, you have to remain in mouse mode while making those selections.

To use the Cartooners setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "CARTOONS" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk; insert the Cartooners program disk and hit "Return." The disk will boot automatically to the Finder. Double-click on the Cartooners "projector" icon to launch Cartooners. After loading, you will be asked to eject the program disk and insert the Cartooners Art Disk. At the main menu, select Create.
4. Place the Cartooners overlay under the plastic cover of the Unicorn Expanded Keyboard.

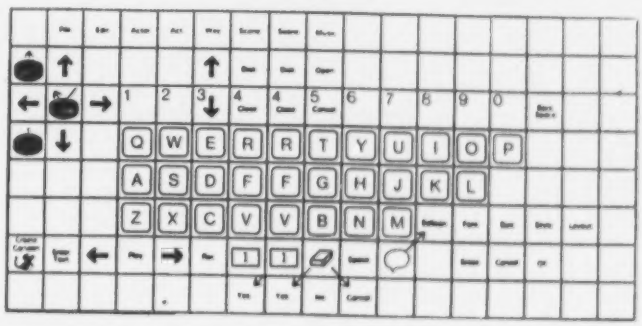
Figure 17

Enter mouse emulation mode by selecting Create Cartoon in the lower left corner of the overlay. You are now ready to use the setup and overlay. You will notice that the mouse and keyboard continue to function, while you can use the Unicorn Board to emulate all functions of the mouse and keyboard. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

The creative thrill experienced in using Cartooners brings out the "Walt Disney" in kids and adults alike. Now physically handicapped persons can join in experiencing that creative thrill as they give vent to their creative impulses.

Music Studio

Music Studio 2.0 is a fast, fun, and creative way to compose, edit, orchestrate, record, and play music. It comes with three disks: one is a program disk that works with 512K Apple IIGS's; one is a program disk that requires 768K of memory; and one is a disk full of songs and additional instruments.

The *Music Studio* offers a number of features for composing and playing back your musical compositions:

- Use standard musical notation: notes, rests, key and time signatures, accidentals, repeats, and more.
- Work with the mouse, using intuitive "point and click" tools.
- Edit musical scores easily: move, repeat, or copy sections of a song, and transpose passages up or down.
- Orchestrate songs using a number of instrument voices.

- Enter notes and chords with a mouse or with real-time recording--directly from your MIDI equipped instrument.
- Play songs through MIDI-compatible instruments.
- Save and play back your songs at any time.
- Add up to three verses of lyrics to your songs.
- Edit or design instruments with a professional-style waveform editor.
- Multi-track feature lets you isolate parts of a song: harmony, melody, rhythm.

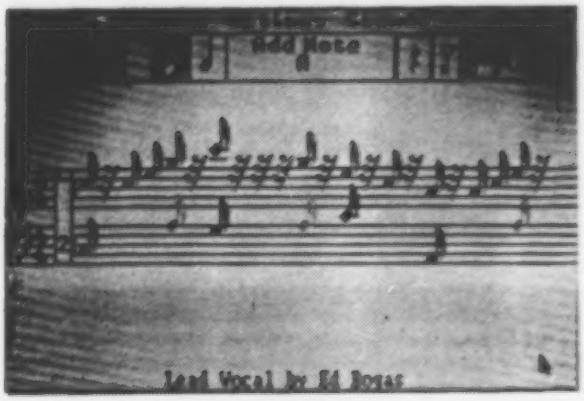

Figure 18

A quick comparison of the *Music Studio* screen (see Figure 18.) and the *Music Studio* overlay (see Figure 19.) reveals that the overlay has some additions not seen on the screen. First, all fifteen of the default instruments (i.e., those loaded when *Music Studio* first starts up) can be chosen directly from the Unicorn Board. This eliminates the need to latch down a menu and scroll through a long list of instruments to select the one you desire. Second, the six different notes can be selected directly also. Third, you may have noticed what looks like fingerprints on the staff on the *Music Studio* overlay. Tapping on one of these will instantly jump a selected note to that location on the staff, where it can be more precisely placed by using the navigational arrows. The combination of these work- and time-saving features allow the user to concentrate more on the creative process and less on the mechanics of operating the program.

To use the *Music Studio* setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "MUSICSTDIO" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk; insert the *Music Studio* program disk and hit "Return." The program will load automatically.
4. Place the *Music Studio* overlay under the plastic cover of the Unicorn Expanded Keyboard.

Figure 19

Enter mouse emulation mode by selecting Enter Mouse Mode in the upper left corner of the overlay. You are now ready to use the setup and overlay. You will notice that the mouse and keyboard continue to function, while you can use the Unicorn Board to emulate all functions of the mouse and keyboard. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

The creative power of a program like *Music Studio* has never been accessible to physically handicapped persons before. Besides being a wonderful tool to use in adaptive music classes to teach music concepts and music theory, *Music Studio* may just bring out the creative genius in some handicapped users that may otherwise have gone unexpressed.

HyperStudio

HyperStudio is an authoring tool for creating multi-media presentations, educational courseware, and a myriad other creative uses limited only by the imagination. It runs on an Apple IIGS with a minumum of 768 K of memory; 1.25 MB and a hard disk drive are recommended.

HyperStudio is being used in school settings across the country by children as young as first grade to author multi-media creations incorporating graphics, animation, digitized speech and music, and interactive videodiscs. All of its impressive arrays of sophisticated programming features are accessed through pull-down menus with "point-and-click" simplicity. No traditional programming knowledge is needed.

Precisely because HyperStudio has such a huge array of menu choices (see Figure 20.) we have decided to make most of them immediately accessible on the overlay through instant "hot keys." This alleviates the necessity to pull down and latch a menu, and scroll down through a long list of choices every time a new tool is needed. Through the use of AFC Levels, we have been able to include a full keyboard in this setup (see Figure 21). Notice that many of the keyboard items share a square with a tool. When you choose Leave Mouse Mode, the setup automatically enters Level 2 where they keyboard items are programmed. This is the same as entering Text Mode. Selecting Enter Mouse Mode from Level 2 returns you to mouse emulation mode in Level 1. You will also select the Enter Mouse Mode square before initially using the HyperStudio setup.

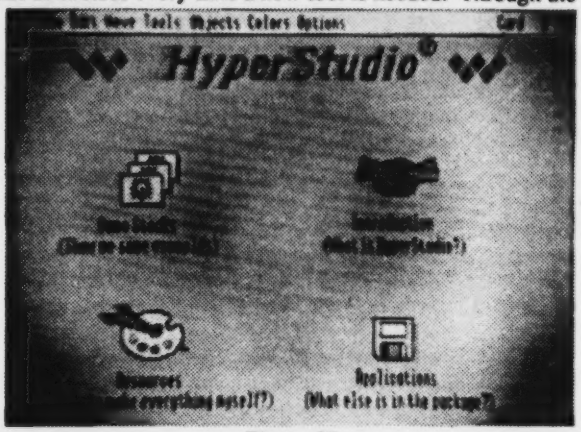

Figure 20

To use the HyperStudio setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "HYPRSTUDIO" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk; insert the HyperStudio program disk and hit "Return." The program will load automatically.
4. Place the HyperStudio overlay under the plastic cover of the Unicorn Expanded Keyboard.

Enter mouse emulation mode by selecting Enter Mouse Mode in the upper left corner of the overlay. You are now ready to use the setup and overlay. You will notice that the mouse and keyboard continue to function, while you can use the Unicorn Board to emulate all functions of the mouse and keyboard. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

Figure 21

The HyperStudio AFC setup and overlay, more than any other in this package, fully represents the incredible power of AFC mouse macro programming to save a handicapped user huge amounts of effort so they can focus on the creative process itself.

HyperKeys

HyperKeys is an excellent demonstration of the potential of HyperStudio to create imaginative programs for fun and instruction. HyperKeys is a public domain HyperStudio "stack." It presents to the user an on-screen, one octave, piano keyboard. The color-coded keys are played by clicking on them with the mouse. Above the keyboard (see Figure 22.) you will see the "notes" for one of three melodies: The Alphabet Song, Mary's Lamb, and London Bridge. The notes are represented as color-coded squares or rectangles corresponding to the color-coded keys on the keyboard. By clicking the mouse on the on-screen keys in correspondence to the colored "notes," (or by pushing the correct colored keys on the Unicorn Board overlay, (see Figure 23.) the user will hear the notes being played.

In effect, HyperKeys and the Adaptive Firmware Card turn the Unicorn Board into a one-octave piano keyboard!

To use the HyperKeys setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "HYPERKEYS" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk; insert the HyperStudio program disk and hit "Return." The program will load automatically. If the menu bar is not showing, hit Command-M to toggle it on. Manually eject the HyperStudio program disk from your disk drive and insert the disk with HyperKeys on it. From the File menu in HyperStudio, choose Open. Double-click on HyperKeys in the mini-finder and wait for it to load.
4. Place the HyperStudio overlay under the plastic cover of the Unicorn Expanded Keyboard.

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Enter mouse emulation mode by selecting Enter Mouse Mode in the upper left corner of the overlay. You are now ready to use the setup and overlay. You will notice that the mouse and keyboard continue to function, while you can use the Unicorn Board to emulate all functions of the mouse and keyboard. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

After using HyperKeys for a time, you may find yourself wishing that there were more than three song choices available! Since HyperStudio stacks are easily modified, this can be easily done by adding additional cards to the stack and adding your own color-coded notes for new songs.

HyperKeys may be purchased for $5.00 from:

HyperStudio Network
Box 183
Blawenburg, NJ 00504
Ask for "Early Learning" disk #ST002.

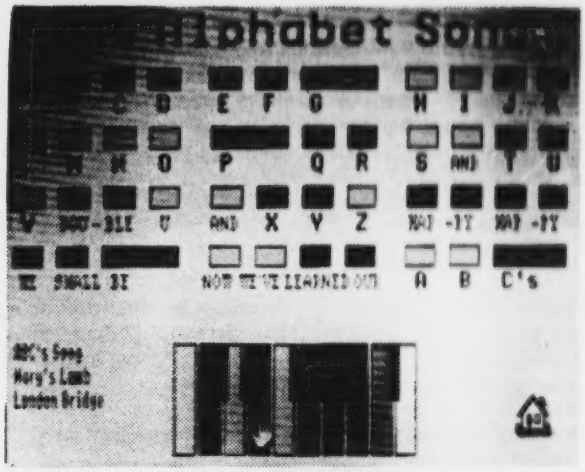

Figure 22

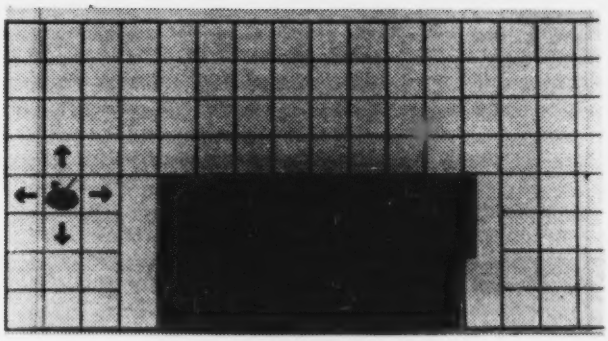

Figure 23

Once Upon a Time

Once Upon a Time, by CompuTeach, is another creative writing tool that mixes computer graphics with text. Although only the Apple IIGS version is supported here, there is also a version for the IBM. Several extensions to Once Upon a Time have come out since the original appeared. The overlay included here is for the original version only, and may not work with later incarnations.

Once Upon a Time allows creation of multiple page stories that can either be self-running on the computer, or printed out and bound as a book. A look at pictures of the screens, (see Figure 24.) and the overlay (see Figure 25.) reveals significant differences in layout. There is a keyboard on the overlay for text entry, and two sets of navigational arrows. Although all the menu choices on the screen are also represented on the overlay, these are laid out in a different orientation in order to allow placement of the keyboard on the overlay. The default screen of Once Upon a Time is "Day 1." Other choices, selectable from the Background menu on the menu bar, are Day 2, Night 1 and Night 2. A choice of sixteen colors are accessible from the Colors menu also on the menu bar.

To place a new picture on the screen, first choose Draw Object. This will cause a menu to appear corresponding to the lower left corner of the overlay. You may toggle between Farm, Main Street, and Safari. You will then type in the name of a picture. The setup should have shifted automatically into text mode to allow you to do this. However, if strange characters appear on the text line when you start typing, it means that the setup is still in Mouse Emulation mode. Select Write Story (in upper right corner) of the overlay and then use Backspace to erase the unwanted characters. Type the name of your selection, and then hit OK. You should automatically re-enter mouse emulation mode, and be ready to move the picture to where you want it, and color it if you wish.

To write about your picture, select Write/Edit and a text window will appear. You will automatically be in text mode, but if you wish to edit pre-existing text, you may need to re-enter mouse mode (choose Create Picture) and use the arrows on the overlay to position your cursor correctly, then hit Write Story to re-enter text mode.

To use the Once Upon a Time setup, do the following:

1. Load your Adaptive Firmware Card setup disk and choose "Once Upon" from the Extended Menu.
2. Hit Return three times; wait until you see the message that the setup has been loaded.
3. Eject the AFC disk; insert the Once Upon a Time program disk and hit "Return." The program will load automatically.
4. Place the Once Upon a Time overlay under the plastic cover of the Unicorn Expanded Keyboard.

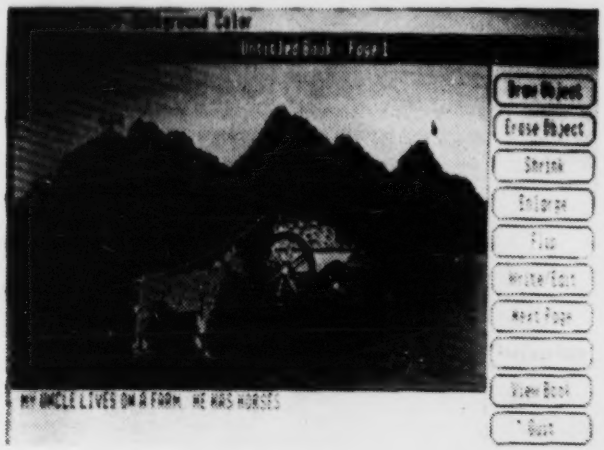

Figure 24

Enter mouse emulation mode by selecting Create Picture in the upper left corner of the overlay. You are now ready to use the setup and overlay. You will notice that the mouse and keyboard continue to function, while you can use the Unicorn Board to emulate all functions of the mouse and keyboard. This is helpful if an able-bodied and a disabled user are using the program in collaboration.

The Once Upon a Time AFC setup tightly integrates the mouse emulation and text modes. Each of the mouse macros "falls out" of mouse emulation mode and back into text mode after execution. The user is not aware of all the mode switching going on in the background. Extensive testing has shown this setup to be very stable; however, a Write Story square and Create Picture square are provided on the overlay for manual entry into text or mouse mode respectively in case they are ever needed.

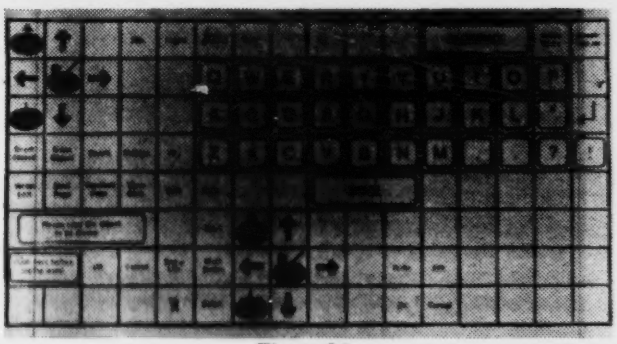

Figure 25

Although Once Upon a Time lacks some of the "flashier" graphics, painting tools, and musical accompaniment of KidWriter Gold, it is still a quite adequate creative writing tool. Perhaps the feature that teachers like best about it is the requirement that a student type in the name of the graphic that he/she wishes to select, rather than simply clicking on the picture choice. By the time the story is done, the student has gotten in a good deal of spelling practice!

B) Adaptive Firmware Card/TouchTalker-LightTalker

Three Adaptive Firmware Card setups for use with the TouchTalker and LightTalker are included on the AFC Menu and Construction disk. They allow you to use the TouchTalker/LightTalker as alternative keyboards for operating the Electric Crayon (see Figure 26 a,b), KidWriter Gold (see Figure 27 a,b), and PaintBox (see Figure 28 a, b). These setups have the letters "KEI" after them in the setup menu, which stands for "Keyboard Emulating Interface."

The only difference in using mouse emulation with a TouchTalker/LightTalker as opposed to the Unicorn Board is in using the continuous movement directional arrows. On the Unicorn Board, pressing and holding down a directional arrow key will cause continuous movement of the cursor on the screen. Releasing the directional arrow key will stop cursor movement instantaneously. In addition, quite precise cursor placement can be achieved by "tapping" on a direction arrow key to "nudge" the cursor to the precise point where you want it.

However, this is not possible when using navigational arrows on the TouchTalker/LightTalker. The TT/LT keyboard is composed of discrete on/off switches, as opposed to the Unicorn Board's momentary switches. When a TT/LT switch is depressed, the device sends a single ASCII character out the serial port to the Adaptive Firmware Card, where it is interpreted as a mouse macro, a letter or numeral, or a **single** cursor movement. Simply holding

down a TT/LT key will not result in a continuous cursor movement. Through some programming tricks, it is possible to set the cursor in continuous movement with a single TT/LT keypress. It then requires a second keypress to halt the cursor movement. Alternatively, selecting a different directional arrow with halt the cursor and immediately send it in a new direction.

For the client who has slow reaction time, you can choose to slow down the computer's processor speed through the Adaptive Firmware Card using <CTRL> A-2. This action is adjustable, and results in the cursor moving slower than normal. Alternatively, the client can use the three sets of directional arrows that provide for small, medium and large incremental cursor movements.

To use these AFC setups, you must first program into a one-or two-symbol theme on your device the following special codes. The bold letters and numbers (e.g., D7) correspond to the column and row on your TouchTalker/LightTalker 128-location overlay grid.

After you have programmed these codes into your device, select from Fixed Base: Serial Port B, Baud=300, and Serial On. Then switch to communication mode and turn your device off.

Connect the 25-pin end of the Prentke-Romich Co. "AFC-1" cable to Serial Port B, and connect the 36-pin Centronics connector on the other end to the AFC I/O box.

Boot your computer with the AFC Menu and Construction Disk and select and load a KEI setup. Type "T" to get the test window, and turn your TT/KT on. Select a few locations to determine if characters are being sent properly to the Adaptive Firmware Card. Then hit "escape" on they keyboard, and eject the AFC setup disk. Insert your application disk and hit return. Place the special overaly that corresponds to your program on your device.

When the program has loaded, enter mouse emulation mode by selecting the "mouse icon" in the upper left corner of your overlay. Other ways of entering mouse emulation are to simply turn your TT/LT off and then back on; or to hit the sequence "/ =" from the keyboard.

You may now use your application program in much the same way as you would use it from the Unicorn Board.

Be aware that the KidWriter Gold AFC setup has some limitations. You will not be able to use the arrows to go to a new page or a previous page, or to play music. You also will not be able to type numbers, use lower case letters, or use any punctuation other than a (.) period. The reason is that this is that the TouchTalker/LightTalker is capable of generating just so many ASCII characters for the AFC to re-interpret. In the case of the KidWriter Gold setup, the number of commands needed to fully implement the setup exceeded the number of ASCII characters that the TT/LT is able to generate! A T-TAM setup for KidWriter Gold is currently being developed that will not have any of these limitations.

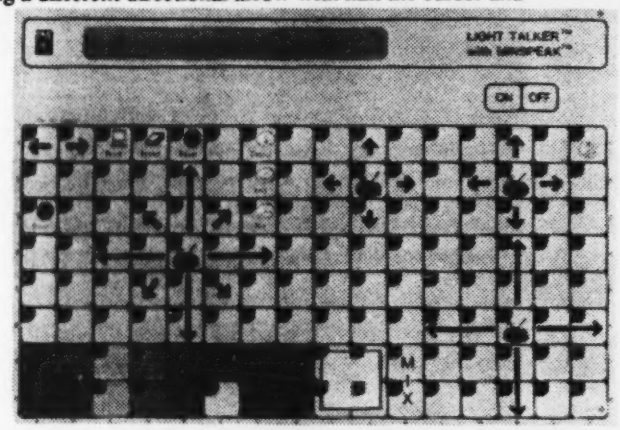

Figure 26a

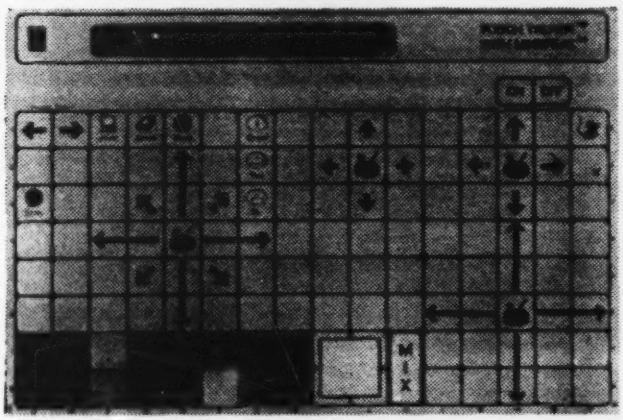

Figure 26b

Figure 27a

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Figure 27b

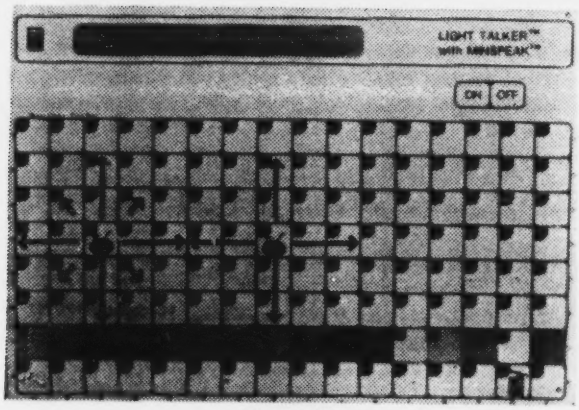

Figure 28a

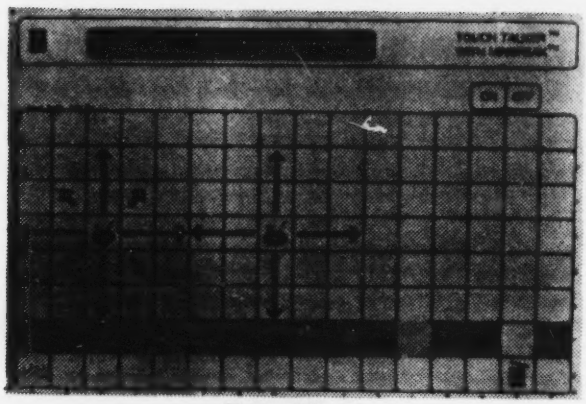

Figure 28b

ELECTRIC CRAYON-AFC CODE

A1 = 1
B1 = 2
C1 = 3
D1 = 4
E1 = 5
G1 = 6
J1 = I
N1 = U
P1 = <ESC>MOUSE.

E2 = E
G2 = 7
I2 = J
J2 = C
K2 = K
M2 = L
N2 = C
O2 = R

D3 = [
E3 = E
F3 =]
G3 = 8
J3 = M
N3 = D

C4 = H
D4 = H
E4 = C
F4 = N
G4 = N
N4 = W

D5 = ' (APOSTROPHE)
E5 = O
F5 = /
N5 = W

E6 = O
L6 = A
M6 = A
N6 = C
O6 = S
P6 = S

A7 = 9
B7 = 0 (ZERO)
C7 = !
D7 = @
E7 = #
F7 = $
G7 = %
H7 = ;
K7 = &
N7 = Z

A8 = *
B8 = (
C8 =)
D8 = - (HYPHEN)
F8 = <
G8 = >
H8 = ?
K8 = &
N8 = Z

L1 = 5
M1 = 5
N1 = 5
O1 = Q
P1 = =

B2 = 0 (ZERO)
D2 = Q
E2 = W
F2 = E
G2 = R
H2 = T
I2 = Y
J2 = U
K2 = I
L2 = O
M2 = P

A3 = _ (UNDERLINE)
B3 = C
C3 = ?
D3 = A
E3 = S
F3 = D
G3 = F
H3 = G
I3 = H
J3 = J
K3 = K
L3 = L

B4 = @
D4 = Z
E4 = X
F4 = C
G4 = V
H4 = B
I4 = N
J4 = M
L4 = . (PERIOD)

A5 = [
B5 = :
C5 =]
D5 = ^
E5 = - (HYPHEN)
F5 = !
G5 = "
H5 = #
J5 = (SPACE)

A6 = $
B6 = %
C6 = &
D6 = ' (APOSTROPHE)
E6 = (
F6 =)
G6 = *
M6 = U

A7 = +
B7 = <
C7 = >
I7 = 1
J7 = 2
K7 = 3
L7 = L
M7 = C
N7 = R

A8 = 4
B8 = 5
D8 = 6
F8 = 7
H8 = 8
I8 = 9
J8 = ;
M8 = D

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PAINT BOX-AFC CODE

C2 = *
H2 = U

B3 = +
C3 = *
D3 = N
H3 = U

A4 = -
B4 = -
C4 = C
D4 = O
E4 = O
F4 = L
G4 = L
H4 = C
I4 = R
J4 = R

B5 = /
C5 = <
D5 = >
H5 = D

C6 = <
H6 = D

A7 = 0 (ZERO)
B7 = 1
C7 = 2
D7 = 3
E7 = 4
F7 = 5
G7 = 6
H7 = 7
I7 = 8
J7 = 9
K7 = !
L7 = #

M7 = $
N7 = %
P7 = (

A8 = &
O8 =)

C) T-TAM/TouchTalker-LightTalker

In addition to the three AFC setups for the TT/LT, we have also included two setups for the Trace-Transparent Access Module. These are for the Electric Crayon on the IBM (see Figure 29.) and MyPaint on the Apple IIGS (see Figure 30 a,b).

The way in which the T-TAM allows the TouchTalker/LightTalker to communicate with the computer is quite different from the AFC. There is no setup disk to load, but you do have to interface the T-TAM to the computer. Information on connecting to an Apple IIGS/Macintosh/IBM can be found in the T-TAM manual.

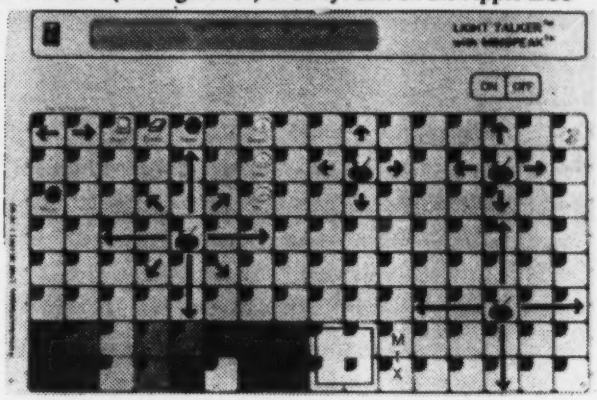

Figure 29

All the code that your communication device needs to be able to communicate with the computer through the T-TAM must be stored in a one- or two-symbol theme in the device itself. For information on specific T-TAM commands and what they do, see Part III of this manual.

You will find all the T-TAM code that you need to operate Electric Crayon on the IBM and MyPaint on the Apple IIGS in this section. Program in the commands exactly as written with one exception: on the TouchTalker/LightTalker the <ESC> sequence is generated by selecting from the 128-Fixed Overlay CTRL in location **I8** and then [in location **D3**. Do not add a space between them. When you select these two characters, you will not see anything on the TT/LT display, but the cursor will move one space to the right. Then type a comma followed by the command and a period.

To connect the TT/LT to the T-TAM you will need a serial cable with a DB-25 male connector on one end, and a DB-25 female connector on the other. Configuring the TT/LT for serial communication is the same as with the AFC. From 128-Fixed, select Serial Port B, Baud=300, and Serial ON. In addition, you must make sure to select BOTH Speech Off and Display Off. If the dispay is turned on, the T-TAM command strings will fill up the first 40 characters of the display buffer instead of being immediately sent out the serial port to the T-TAM. To ensure that all commands, especially long macros, are executed properly, **be sure to turn the display off.**

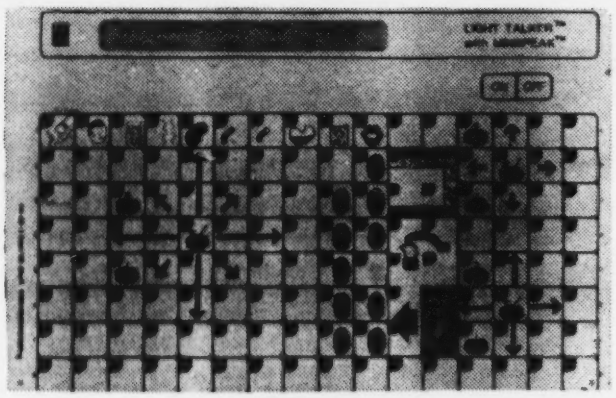

Figure 30a

The problems that we encounter with cursor navigation with the AFC also apply to the T-TAM. Using the main cluster of up, down, right, left, and diagonal navigational arrows, you can start the cursor in motion and it will keep moving until you choose a different arrow, or select Stop in location **A3**. As with the AFC overlays, we have included three additional clusters of arrows for moving in small, medium, and large increments.

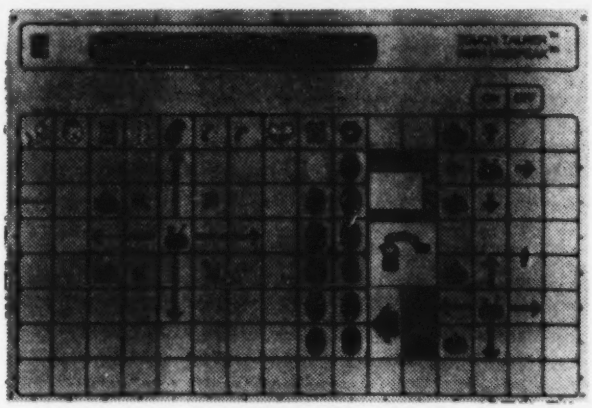

Figure 30b

Although there is no mouse emulation mode per se in a T-TAM setup it is necessary to activate location **P1** in the upper left corner of

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the overlay to invoke the T-TAM's MouseKeys feature. When you select this square, you will hear an "up siren" and you will be able to use the main cluster of navigational arrows on your overlay. In addition, you will now be able to use the numeric keypad on your keyboard as a mouse in the same fashion.

On the MyPaint overlay, you will notice in addition to the Click button, buttons for mouse down and mouse up states. To use any of the drawing tools, you must start with Button Down, and terminate drawing with Button Up.

Electric Crayon T-TAM Code for IBM:

A1
<ESC>,MOURESET.<ESC>,GOTO,+20,+20.<ESC>,CLICK.

B1
<ESC>,MOURESET.<ESC>,GOTO,+30,+20.<ESC>,CLICK.

D1
<ESC>,MOURESET.<ESC>,GOTO,+85,+15.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+111,+38.
<ESC>,CLICK.

G1
<ESC>,MOURESET.<ESC>,GOTO,+119,+15.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.
<ESC>,CLICK.

J1
<ESC>,MOVE,+0,-10.

N1
<ESC>,MOVE+0,-20.

P1
<ESC>,MOU,MKEYS,ON.

E2
<ESC>,LOCK,KPUP.

I2
<ESC>,MOVE,-10,-0.

J2
<ESC>,CLICK.

K2
<ESC>,MOVE,+10,-0.

M2
<ESC>,MOVE,-20,-0.

N2
<ESC>,CLICK.

O2
<ESC>,MOVE,+20,+0.

A3
<ESC>,REL.

D3
<ESC>,LOCK,KPHOME.

E3
<ESC>,LOCK,KPUP.

F3
<ESC>,LOCK,KPPGUP.

J3
<ESC>,MOVE,+0,+10.

N3
<ESC>,MOVE,+0,+20.

C4
<ESC>,LOCK,KPLEFT.

D4
<ESC>,LOCK,KPLEFT.

E4
<ESC>,CLICK.

F4
<ESC>,LOCK,KPRIGHT.

G4
<ESC>,LOCK,KPRIGHT.

N4
<ESC>,MOVE,+0,-40.

D5
<ESC>,LOCK,KPEND.

E5
<ESC>,LOCK,KPDOWN.

F5
<ESC>,LOCK,KPPGDN.

N5
<ESC>,MOVE,+0,-40.

E6
<ESC>,LOCK,KPDOWN.

L6
<ESC>,MOVE,-40,+0.

M6
<ESC>,MOVE,-40,+0.

N6
<ESC>,CLICK.

O6
<ESC>,MOVE,+40,+0.

P6
<ESC>,MOVE,+40,+0.

A7
<ESC>,MOURESET.<ESC>,GOTO,+49,+95.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

B7
<ESC>,MOURESET.<ESC>,GOTO,+60,+95.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

C7
<ESC>,MOURESET.<ESC>,GOTO,+69,+95.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

D7
<ESC>,MOURESET.<ESC>,GOTO,+75,+95.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

E7
<ESC>,MOURESET.<ESC>,GOTO,+85,+95.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

F7
<ESC>,MOURESET.<ESC>,GOTO,+94,+95.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

G7
<ESC>,MOURESET.<ESC>,GOTO,+103,+95.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

H7
<ESC>,MOURESET.<ESC>,GOTO,+111,+95.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

K7
<ESC>,MOURESET.<ESC>,GOTO,+148,+95.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

N7
<ESC>,MOVE,+0,+40.

A8
<ESC>,MOURESET.<ESC>,GOTO,+49,+101.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

B8
<ESC>,MOURESET.<ESC>,GOTO,+60,+101.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

C8
<ESC>,MOURESET.<ESC>,GOTO,+69,+101.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

D8
<ESC>,MOURESET.<ESC>,GOTO,+75,+101.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

E8
<ESC>,MOURESET.<ESC>,GOTO,+85,+101.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

F8
<ESC>,MOURESET.<ESC>,GOTO,+94,+101.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

G8
<ESC>,MOURESET.<ESC>,GOTO,+103,+101.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

H8
<ESC>,MOURESET.<ESC>,GOTO,+111,+101.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

K8
<ESC>,MOURESET.<ESC>,GOTO,+148,+101.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+80,+60.

N8
<ESC>,MOVE,+0,+40.

MyPaint T-TAM Code for Apple IIGS

A1
<ESC>,MOURESET.<ESC>,GOTO,+18,+20.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

B1
<ESC>,MOURESET.<ESC>,GOTO,+44,+20.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

C1
<ESC>,MOURESET.<ESC>,GOTO,+80,+20.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

D1
<ESC>,MOURESET.<ESC>,GOTO,+110,+20.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

E1
<ESC>,MOURESET.<ESC>,GOTO,+150,+20.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

F1
<ESC>,MOURESET.<ESC>,GOTO,+175,+20.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

G1
<ESC>,MOURESET.<ESC>,GOTO,+202,+20.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

H1
<ESC>,MOURESET.<ESC>,GOTO,+230,+20.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

I1
<ESC>,MOURESET.<ESC>,GOTO,+265,+20.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

J1
<ESC>,MOURESET.<ESC>,GOTO,+300,+20.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

M1
<ESC>,MOUREL.

N1
<ESC>,MOVE,+0,+25.

E2
<ESC>,LOCK,KPUP.

I2
<ESC>,MOURESET.<ESC>,GOTO,+275,+45.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

J2
<ESC>,MOURESET.<ESC>,GOTO,+300,+45.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

K2
<ESC>,MOURESET.<ESC>,GOTO,+300,+45.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

L2
<ESC>,MOURESET.<ESC>,GOTO,+300,+45.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

M2
<ESC>,MOVE,-25,+0.

N2
<ESC>,CLICK.

O2
<ESC>,MOVE,+25,+0.

A3
<ESC>,REL.

C3
<ESC>KPDEL. {NOTE: there is NO comma after <ESC> in this command!}

D3
<ESC>,LOCK,KPHOME.

E3

<ESC>,LOCK,KPUP.

F3
<ESC>,LOCK,KPPGUP.

I3
<ESC>,MOURESET.<ESC>,GOTO,+275,+70.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

J3
<ESC>,MOURESET.<ESC>,GOTO,+300,+70.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

K3
<ESC>,MOURESET.<ESC>,GOTO,+300,+70.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

L3
<ESC>,MOURESET.<ESC>,GOTO,+300,+70.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

M3
<ESC>,MOULOCK.

N3
<ESC>,MOVE,+0,+25.

C4
<ESC>,LOCK,KPLEFT.

D4
<ESC>,LOCK,KPLEFT.

E4
<ESC>,CLICK.

F4
<ESC>,LOCK,KPRIGHT.

G4
<ESC>,LOCK,KPRIGHT.

I4
<ESC>,MOURESET.<ESC>,GOTO,+275,+100.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

J4
<ESC>,MOURESET,<ESC>,GOTO,+300,+100.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

K4
<ESC>,MOURESET.<ESC>,GOTO,+300,+100.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

L4
<ESC>,MOURESET.<ESC>,GOTO,+300,+100.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

C5
<ESC>KPINS. {NOTE: there is NO comma after <ESC> in this command!}

D5
<ESC>,LOCK,KPEND.

E5
<ESC>,LOCK,KPDOWN.

F5
<ESC>,LOCK,KPPGDN.

I5
<ESC>,MOURESET.<ESC>,GOTO,+275,+127.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

J5
<ESC>,MOURESET.<ESC>,GOTO,+300,+127.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

K5
<ESC>,MOURESET.<ESC>,GOTO,+300,+127.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

L5
<ESC>,MOURESET.<ESC>,GOTO,+300,+127.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

M5
<ESC>,MOUREL.

N5
<ESC>,MOVE,+0,-35.

E6
<ESC>,LOCK,KPDOWN.

I6
<ESC>,MOURESET.<ESC>,GOTO,+275,+155.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

J6
<ESC>,MOURESET.<ESC>,GOTO,+300,+155.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

K6
<ESC>,MOURESET.<ESC>,GOTO,+275,+155.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

L6
<ESC>,MOURESET.<ESC>,GOTO,+300,+155.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

M6
<ESC>,MOVE,-50,+0.

N6
<ESC>,CLICK.

O6
<ESC>,MOVE,+50,+0.

I7
<ESC>,MOURESET.<ESC>,GOTO,+275,+183.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

J7
<ESC>,MOURESET.<ESC>,GOTO,+300,+183.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

K7
<ESC>,MOURESET.<ESC>,GOTO,+275,+155.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

L7
<ESC>,MOURESET.<ESC>,GOTO,+300,+155.<ESC>,CLICK.<ESC>,MOURESET.<ESC>,GOTO,+130,+100.

M7
<ESC>,MOULOCK.

N7
<ESC>,MOVE,+0,+35.

HeadMaster
Trace Center Access Utility for TT/LT and MicroSoft Windows 3.0
Ke:nx
VoiceMaster Key
Voice Navigator II

HeadMaster

The HeadMaster from Prentke-Romich Co. is a view control system that works on the Macintosh, Apple IIGS, and IBM and compatibles. In fact, its name was originally "View Control System" when first released in 1985 as a mouse substitute for the Macintosh. The Personics Corporation, which developed the VCS, found that there was a very slim conventional market for such a device. However, the VCS began to gain popularity with handicapped users, who found it gave them ready access to the Macintosh whereas the mouse was impossible for them to use. Personics repackaged the VCS, added a "sip and puff" switch, and renamed it "HeadMaster." Prentke-Romich Co. bought the rights to the device in 1989 and continues to sell it as "HeadMaster."

Briefly, the HeadMaster (see Figure 31.) consists of three parts: a control box which sits atop the host computer's monitor; a lightweight plastic headband; and a sip-and-puff switch. The control box employs low-power CMOS circuitry, and contains a computer based on the 65C02 processor. It generates a 40kHz ultrasonic beam which is received by three ultrasonic microphones on the headband, one at the top and two on either side. The control box detects differences in ultrasonic sound-signal strength that are directly proportional to the angular position of the user's headband. The control box translates these head-motion differences into x-y screen coordinates for plotting the mouse cursor location on the computer monitor. The sip-and-puff switch also emulates the button-clicking functions of the mouse. A light continuous puff allows one to simulate a "button-down" needed for click-and-drag operations. A quick puff simulates a click, and two quick puffs simulate a double-click. When using the HeadMaster, it is best to set the Mouse Tracking option in the operating system's Control Panel to "Very Slow." The HeadMaster itself also has three sensitivity settings on the control unit.

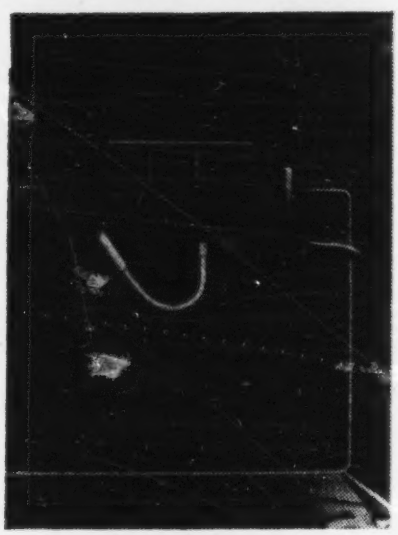


Figure 31

Originally, the HeadMaster worked only on the Macintosh 128, 512, and Plus with a DB-9 mouse connector. Prentke-Romich Co. has come up with a clever mouse adapter for the Macintosh SE and above line of computers that use the new Apple Desktop Bus (ADB) connectors. This method involves rewiring an ADB mouse to add a DB-9 connector. The DB-9 connector on the HeadMaster can then plug directly into the DB-9 connector on the modified mouse, which itself is plugged into the mouse port on the keyboard. The modified mouse is itself rendered inoperable as a conventional mouse by this procedure. The modified ADB mouse, which is available from Prentke-Romich Co. for $149.95, also allows the HeadMaster to work with the Apple IIGS computer. The Apple IIGS uses the same ADB technology as the Macintosh SE and above line.

In addition, Prentke-Romich now markets a modified IBM-compatible mouse for the same price that allows the HeadMaster to work with IBM mouse-equipped computers. Again, the mouse is modified to accept the HeadMaster's DB-9 connector. There are two main differences between the IBM adapter and the Macintosh/Apple IIGS adapter: the IBM adapter requires an external power supply since it cannot draw power from the IBM's COM1 port, and it also requires that special mouse-driver software be loaded before it can be used. This procedure can be streamlined by modifying the DOS AUTOEXEC.BAT file to automatically load the mouse driver upon startup.

The HeadMaster is appropriate for those persons who have limited manual skills, but fairly good head control. It is not neccessary to have a wide range of head motion; in fact, two to three inches laterally and vertically should be adequate. Because the HeadMaster uses the direct-select method, and because it is a perfectly transparent mouse emulator, many handicapped users can perform mouse-based operations with it as fast as their able-bodied peers.

Typing with the HeadMaster is considerably slower than using the keyboard. Several desk accessories are available which put images of the keyboard on the screen for text input. By simply "looking" the cursor over a

letter and puffing on the mouth switch, the letter is typed into your word processing document. For instance, "WordWriter," from McIntyre Systems, includes a predictive dictionary with word "slots" on either side of the keyboard image. After typing the first two or three letters of a word, if that word is in the dictionary it will appear in a slot. After clicking on the word, the rest of the word is automatically typed by the computer.

As for graphics-intensive programs, most able-bodied persons will prefer using the mouse. However, the HeadMaster opens up enormous creative possibilities to handicapped persons that they could not otherwise hope to approach. For example, virtually all functions in paint programs, such as MacPaint, Paintworks Plus, or PC Paintbrush are accessible through the HeadMaster. Some handicapped HeadMaster users are able to develop quite fine head control, and are doing intricate art work on the computer. In addition, music programs such as Music Studio open up a whole range of music composition options.

A seventeen-year old HeadMaster user in the Young Artist Workshop created some stunning animated cartoons using "Cartooners" on the IBM. The creative freedom he experienced can hardly be appreciated without knowing that prior to using the HeadMaster his only computer access was a slow, clumsy alphabetic scanning system using a single switch!

Trace Access Utility for Windows 3.0

The Trace Research and Development Center at the University of Wisconsin-Madison has developed several software solutions in the past for providing access to MS-DOS computers for people with physical impairments. Currently there are access programs that provide features such as StickeyKeys (for individuals who type with one finger, a headstick, or a mouthstick), SlowKeys (for individuals who tend to accidentally hit keys), AutoRepeat Adjustment (for individuals who are slower at releasing keys), MouseKeys (for individuals who cannot use the mouse) and Emulating Interfaces (for individuals who cannot use the keyboard at all but can use a communication aid that has a serial port).

However, none of these software solutions work with Windows applications running under Microsoft Windows on IBM's and compatibles. A solution was developed by the Trace R&D Center to provide these features for Microsoft Windows 2.0 and 3.0. This was accomplished by rewriting the keyboard and mouse device drivers--the software routines which interpret signals coming from the keyboard and mouse.

For computers running MS-DOS, software solutions for providing computer access rely on the fact that PC operating systems allow Terminate and Stay Resident (TSR) programs to exist, and that these TSR programs can hook into the keyboard, mouse, serial port, timer, and/or other software and hardware interrupts.

However, when using Microsoft Windows, the TSR approach is not compatible. Windows takes over many of the software and hardware interruts and replaces them with its own. Windows reinstalls the original interrupts only when exiting out of Windows or when running a non-Windows application from within Windows. Therefore, the special access software TSR's do not work under Windows when the user is running Windows applications.

The Trace R&D Center has completed a Windows keyboard device driver that implements StickeyKeys, SlowKeys, RepeatKeys, and ToggleKeys, and which, in conjunction with the mouse device driver, implements MouseKeys.

Serial port access, or SerialKeys, is also included. SerialKeys follows the General Input Device Emulating Interface (GIDEI) Standard, and provides transparent access for communication aids capable of serial ASCII character transmission.

SerialKeys allows one to directly connect a communication aid, such as a TouchTalker or LightTalker to a PC. A serial cable with DB-25 connectors is used to connect to Serial Port B on your TT/LT. The other end plugs into a 25-pin RS232 Null Modem Adapter which in turn plugs into the COM1 serial port on the pack of the PC. You will have to configure the aid for serial communication, i.e., Serial Port B, Baud Rate=300, Serial On.

The aid's custom overlay can be programmed for full keyboard and mouse control, including mouse macros, using the same programming procedure and codes that are used with the T-TAM.

SerialKeys, in effect, emulates the T-TAM in software. So when running Microsoft Windows 2.0 or 3.0 the T-TAM is not necessary.

It should be noted that MicroSoft Windows 3.0 comes bundled with a desk accessory called PC Paintbrush and two DA games, Solitaire and Reversi. It also has a DA version of a keyboard/mouse macro utility called Recorder. It is much easier to program mouse macros with the Recorder utility than to program them using the SerialKeys mouse macro codes. With Recorder, you can assign each mouse macro a keyboard command equivalent, which greatly simplifies programming the TT/LT overlay for mouse emulation. Programming mouse emulation interfaces for new Windows 3.0 paint/draw, CAD, and creativity programs for LT/TT users will now be easier than ever before.

With the proliferation of Windows compatible programs now coming out, there will soon be a huge library of programs that will work with the Trace R&D Center's Window's keyboard, mouse, and SerialKeys device drivers.

Of all the adaptive interfaces tested, this is by far the least expensive way to interface an alternative ASCII input device to a computer. The proper serial modem cable with DB-25 connectors on each end may be bought from JAMECO Electronics (ph. 415-592-8097) for $6.95 (part # MF2210), and the Full Handshaking Null Modem Adapter (part # FNULF) costs $4.95.

The Trace Access Utility, as well as dozens of other utilities and special software drivers, are all available on the Microsoft Windows 3.0 Supplemental Driver Library, a set of seven 3.5" disks available for $20.00 from MicroSoft Corporation (ph. 1-800-426-9400).

Note: As this publication went to press, we saw a demo of the Trace Center's new AccessDOS utility that emulates a T-TAM entirely in software under the new DOS 5.0. AccessDOS, which includes all the features of the Windows 3.0 Access Utility and more, extends TouchTalker/LightTalker connectivity to ALL non-Windows programs, including full mouse emulation capabilities! AccessDOS can be acquired from your local IBM educational representative for little for no charge.

Ke:nx

The Ke:nx adaptive input system from Don Johnston Development Equipment, Inc. is the Macintosh equivalent, in most ways, to the Adaptive Firmware Card on the Apple II/IIGS. The Ke:nx supports **scanning** with a single switch and **Morse Code** with up to three switches. It has a connector for attaching **alternative keyboards**, such as the Unicorn and King/Mini keyboards. It also support **Assisted Keyboard** features such as latching, key rearrangement, and definable "accept" times. However, it does not support ASCII input; therefore it is not possible to use a dedicated communication aid, such as a TouchTalker, as an alternative keyboard.

The Ke:nx package comes with the Ke:nx hardware box, an ADB cable, and two 3 1/2" disks that contain the Ke:nx software. The Ke:nx hardware box has a latching on/off pushbutton switch that allows turning off the Ke:nx when attaching switches and alternative keyboards. It has two ADB ports, three switch jacks, and a 36 pin Centronics connector.

The Ke:nx only works with Macintosh SE and later models which employ the Apple Desktop Bus (ADB) architecture. If the mouse on your Macintosh plugs into the keyboard, then you have an ADB machine. If the mouse has a nine-pin connector and plugs into the back of your Macintosh, then the Ke:nx will not work with your machine.

Installing the Ke:nx hardware box is quite easy. You simply plug one end of the ADB cable that comes with Ke:nx to one of the ports on the Ke:nx hardware box; then plug the other end into the keyboard's ADB port. You can then plug your mouse into the other ADB port on the Ke:nx. This is called creating a "daisy chain."

Software setup is similarly easy and straightforward. The Ke:nx software also comes with Macintalk, the Macintosh's software speech driver that gives the Macintosh the ability to speak in a voice that is very similar to SmoothTalker. After software is installed, Ke:nx appears on the menu bar in the Finder, and in any application that you launch from the Finder. You may use any of the Ke:nx features at any time.

There are two ways to activate a setup. One is to choose **Setup...** from the Ke:nx menu, resulting in a directory of setups which appear in a scroll box. Choose a setup and click OK; the setup immediately becomes active. The second way to activate a setup is to designate it as the Launch Setup. That way when you switch on your computer, the Launch setup is automatically loaded. It is even possible to activate a setup through the setup itself. A "key" is defined as a branch to another setup. When you select the key, the branch command directly loads a setup. The current setup is "closed" and the second setup becomes active.

New setups are created with the application called "Ke:nx Construction." The entire process is menu driven and follows the familiar Macintosh "point-and-click" interface. You have the option to develop talking setups using Macintalk to give the user and listener speech feedback.

Since our primary interest is mouse emulation, we should point out a couple of differences in terminology between the Ke:nx and the Adaptive Firmware Card. Ke:nx uses the term "marker" to mean the same as "mouse tab" in AFC parlance. Likewise, the Ke:nx uses the term "script" to mean the same as the AFC's "mouse macro." While one can create powerful mouse macros just using the Ke:nx Construction's programming tools, you can also "call" mouse macros created with popular macro utilities such as Tempo II, QuicKeys, and Apple's own MacroMaker.

In terms of providing access to all the features of what I personally feel is the most ideal computer for a physically challenged person to use, the Ke:nx deserves a "five-star" rating.

Besides its small size, capabilities, and ease of use, the Ke:nx has one other feature that is important to those user's who demand portability: it requires no external power supply. A portable laptop Macintosh, combined with the new miniature Unicorn Board and Ke:nx with Macintalk speech output and custom HyperCard communication

software would be far more powerful than any dedicated communication aid on the market today. And with the ability to also run paint/draw, music composition, CAD/CAM and other software on the same machine, would eliminate the expense of costly duplication of equipment.

VoiceMaster Key

The VoiceMaster Key is an inexpensive voice recognition system for the IBM XT/AT and compatibles. It comes in two parts: the hardware "ear" and the software "brain." The "ear" is a combination headset earphone/microphone plus a one-half length plug-in card that fits into any available slot in your PC. The "brain" is a Terminate and Stay Resident (TSR) program that is loaded after loading DOS but before running a main program. VMKey can recognize up to sixteen commands at one time. It can store up to sixteen sets of sixteen commands in memory, and a command in one set can "call" another set. So theoretically, up to 256 commands could be invoked in one program.

VMKey's menu-driven software makes creating voice templates and macro files easy. Voice templates are created by "training" a command three times. On-screen prompts cue when to say the command. The three pronunciations are stored, to be used later as templates for matching against commands input from the microphone. After training a voice template, a macro can be created. The macro is typed on a command line using exactly the same characters one would type from the keyboard to perform the command manually. A macro can be as simple as a letter followed by a return character, a directional cursor arrow, or letterheads or boilerplates to be inserted into word processing programs. Unfortunately, the VMKey cannot control the mouse, and so is of limited utility with mouse-driven software.

Interestingly, VMKey works in DOS only from the command prompt. In DOS 4.0, for example, it does not work as long as the graphical file manager is being used. VMKey also does not work with MicroSoft Windows 3.0. It appears that Windows uses its own keyboard and mouse drivers which VMKey does not have "hooks" to.

In fact, with the limited software testing that was done with VMKey, only one program, KidWriter Gold, worked flawlessly with VMKey. In all fairness, VMKey, it seems, was developed mainly for text-based programs and so it is not surprising to find incompatibilities with graphics-intensive programs.

VoiceMaster Key was tested mainly because of its low price and to see if voice-input could be reasonably used with graphics programs. Although it was found that VMKey has limited usefulness as an alternative input device to operate paint/draw programs, its capabilities were still impressive considering its low price! The fact that VMKey could be used successfully with KidWriter Gold to manipulate graphics and colors and enter text by voice command demonstrated the feasibility of using voice control with creativity programs and led to further research with the Voice Navigator system on the Macintosh.

Voice Navigator II

The Voice Navigator II from Articulate Systems wins this writer's award as the most innovative, powerful, and flexible alternative input device for any computer. It should definitely be considered by any severely physically handicapped person with intact speech. Why should anyone struggle with accessing an alternative keyboard or use a slow scanning system when he/she can command the computer by simply talking to it?

The Voice Navigator II (Figure 32.) will work with the entire Macintosh family of computers from Mac Plus on up. It is a SCSI device that daisy-chains off the SCSI port with any external hard drives or other SCSI devices that you may have. It requires at least 2.5 MB of RAM to function properly. Setup software consists of four 800K disks. Software installation is straightforward and is clearly explained in the manual.

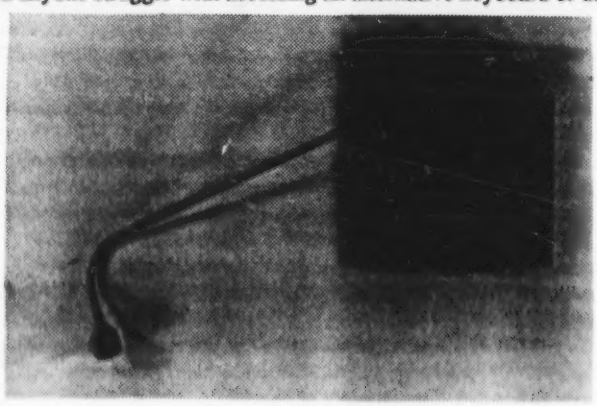


Figure 32

To command the Macintosh through Voice Navigator II, you need both a language file and a voice file. The language file is very similar to an Adaptive Firmware Card setup. It is created with the Language Maker desk accessory and is

application specific. Using a series of menus, one can program the cursor to pull and hold down menus. You can then program any menu choice to be accessed by voice control. There are menus for programming control of dialog boxes, minifinders, and scroll bars. All mouse functions are available: mouse button down, mouse button up, click, and double click. The mouse can be programmed to move up, down, left, and right in any increment of your choice. The mouse can also be programmed to move continuously up, down, left, and right and to stop on voice command.

Mouse tabs can be set anywhere on the screen and can be incorporated into mouse macros. For instance, in a paint program all the paint tools can be accessed by voice. Saying, "bucket" for instance will cause the cursor to jump to the paint bucket, send a mouse click to select it, and send the cursor back to where it started the macro. In a music program, one could select a note and place it on the staff, then specify a choice of musical instruments, all in one mouse macro.

Designing a "language" for a particular application, then, consists of deciding what functions are specific to controlling that application and then programming keyboard and mouse actions. It is notable that macros created with other popular macro utilities for the Macintosh, such as Tempo II, QuicKeys, and MacroMaker can be specified in the "language." This feature greatly extends the power of Voice Navigator II.

The next step is to program voice files that are linked to all the keyboard and mouse actions. Opening Voice Commands brings up a hierarchical listing of all the keyboard and mouse commands that were programmed in the Language Maker. Clicking on a command selects it for voice training. A dialog box prompts you to say the command three times, and then builds a voice template for that command. Continue until all commands are trained. Then save the voice file. It will be automatically linked to the language file, and both will be automatically linked to the application that they were created to control. This means that when you open MacWrite, for instance, the language and voice files for MacWrite also open.

It should be noted that Voice Navigator II is not a voice typewriter. It is a discrete utterance, speaker dependent device and does not have a large recognition vocabulary built in, such as the Dragon Dictate system does. In order to type, one needs to use the radio operators' alphabet, e.g. "a" is "alpha," "b" is "bravo," "c" is "charlie" etc. Short monosyllablic words such as the letters of the alphabet have reduced voice recognition accuracy. Letters such as "b" and "d" can be easily confused. Using the radio operators' alphabet greatly increased recognition accuracy because these codes have been selected based on maximum discriminability in severe listening conditions.

It is possible to create a number of text macros. For example, saying A-S-I can cause "Articulate Systems, Incorporated" to be printed. It is possible to type 12 to 15 words/minute by spelling out words using the radio operators' alphabet.

To determine whether the Voice Navigator II is a viable system for a speaking, severely handicapped person to do word processing with, one would have to assess their speed of access with it as compared to any other alternate access systems, such as expanded keyboards and scanning.

For accessing paint/draw programs and music composition programs, the Voice Navigator II is probably faster than any other alternative input device in terms of activating pre-defined macros. Where it falls down is in efficiency of cursor control. This problem can be eliminated by using the Voice Navigator II in parallel with the HeadMaster; in fact this hybrid combination of head tracking and voice control represents probably the most powerful alternative input system in existence at this time.

APPENDIX II: TROUBLESHOOTING OPERATIONAL DIFFICULTIES

Q: The cursor does not seem to function properly when I am drawing lines or geometric shapes.

A: Drawing lines or shapes requires a "click-and-drag" operation. In normal use, this means holding the mouse button down while moving the mouse. To terminate the action, you let the mouse button up. In mouse emulation, you select "button down" and then start drawing with the navigational arrows. A common error is forgetting to select "button up" at the end of the operation. The cursor will not function properly for subsequent operations until the mouse button is unlatched.

Q: When I am using one of the creative writing programs, the cursor does not move as expected when I select an icon or function on the overlay; or when I am word-processing, I get strange looking strings of characters instead of the key I typed on the keyboard.

A: Mouse macros will not execute if you are not in mouse emulation mode. Shift manually into mouse mode and select the icon or function again. Conversely, you cannot word-process if you are stuck in mouse mode. Try manually shifting into text mode. You may now use the backspace key to get rid of any garbage characters that were accidentally printed.

Q: When I'm in text mode in any of the creative writing programs, the arrow keys don't function when I try to use them to reposition the text-insertion cursor.

A: Temporarily re-enter mouse mode so you can use the arrow keys to reposition the text-insertion cursor. Then toggle back into text mode before you begin typing.

Q: When using the ASCII setups with my TouchTalker/LightTalker, nothing happens when I make selections on my device.

A: First, check to see if you are in mouse emulation mode. You can check this manually by hitting [/=] from your keyboard, or simply turn your device off and then back on. You should hear a beep and see a message on the screen that says "Entering mouse emulation mode." Hit return and make some selections.

If nothing happens, it is possible that your device is not configured correctly to send ASCII characters out Serial Port B to the AFC (see Part II-AFC/TouchTalker-LightTalker). It is good practice to always use the "Test" function after loading an ASCII setup and try sending a few characters to the AFC. If they are printed in the Test Window, then your device is configured correctly, and you can go ahead and load your program disk.

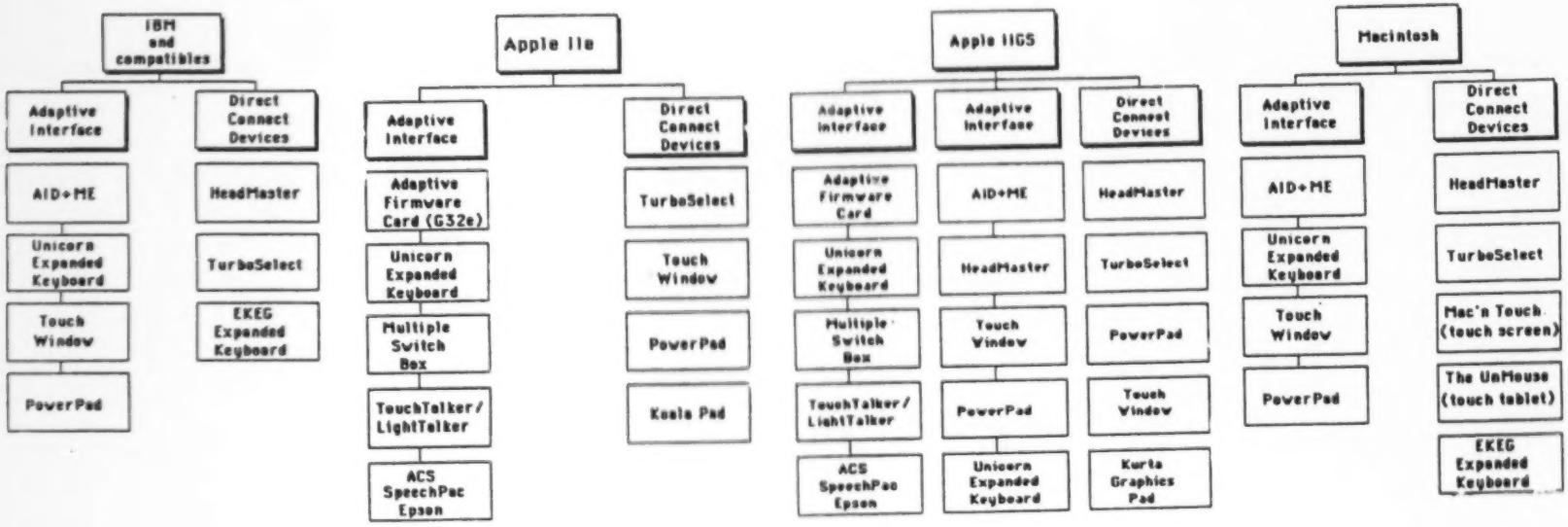
Q: When using the arrow keys on the overlay to move the cursor, the cursor moves faster than my client is able to control it.

A: Hit CTRL A-2 from the keyboard. This will display an AFC menu on the screen that will allow you to slow down the cursor. Choose "Message Rate" and set the rate to a lower setting. You may have to experiment before finding a comfortable rate for your client.

APPENDIX III: EQUIPMENT CONFIGURATION DIAGRAMS

The diagrams on the following pages indicate types of adaptive interfaces, and the alternative input devices which will work with them, for each computer model. In addition, the diagrams show which alternative input devices can be directly connected to a computer without the need for an intermediary adaptive interface. The equipment listed here is not all inclusive, but is fairly representative of the equipment which was available on the market as of July, 1991.

Adaptive Interface Configurations



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